

AUTOMOTIVE INDUSTRIES

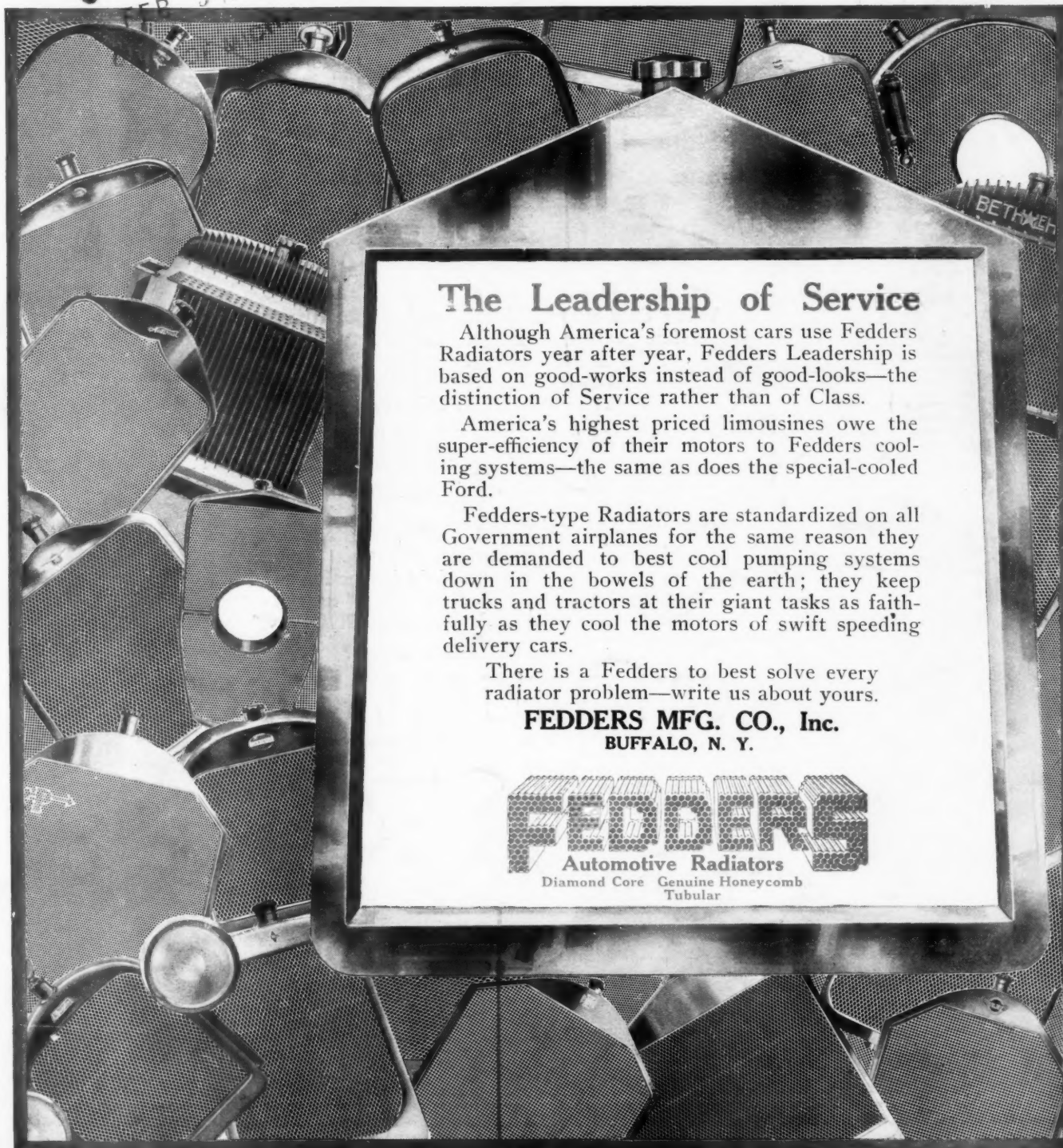
The AUTOMOBILE

Vol. XLII
Number 4

PUBLISHED WEEKLY AT 339 WEST 39th STREET
NEW YORK, JANUARY 22, 1920

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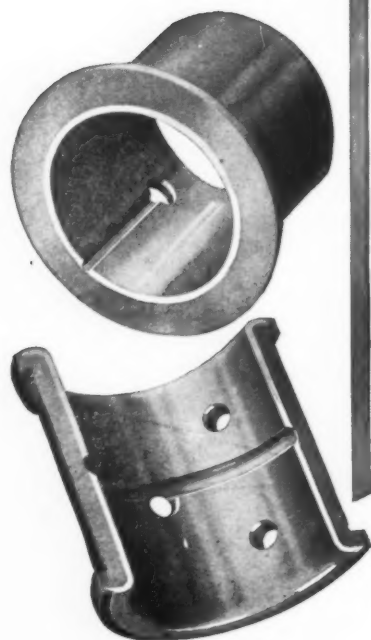
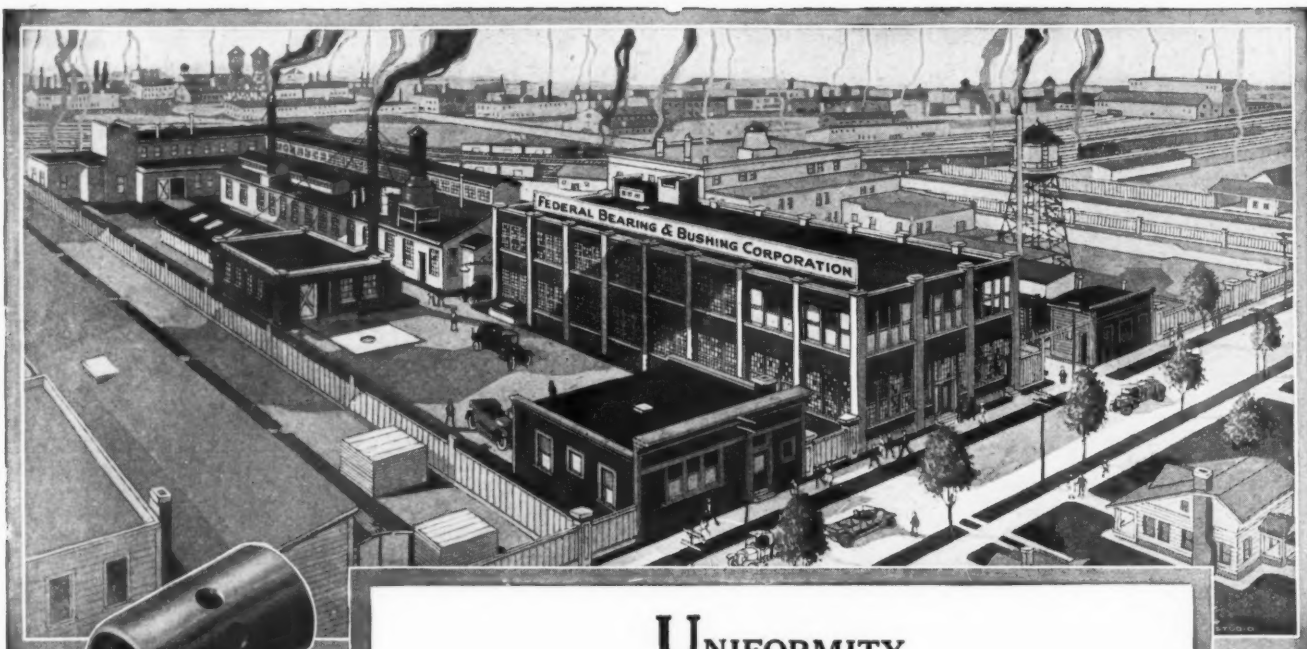
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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLII

NEW YORK—THURSDAY, JANUARY 22, 1920

No. 4

Chicago Air Show Presents Significant Technical Developments

Early automobile shows recalled by Chicago Air Show, where attendance is large chiefly because of curiosity—Commercial features are subordinate to technical development—Much popular interest in Eddie Rickenbacker's "Spad"

MANY designs of technical interest were exhibited at the Chicago Air Show this year, as well as a number of machines which attracted the broader interest of the curious public.

It is practically certain that the novelty of the exhibits, rather than any real interest in the development of the aircraft as a commercial possibility, were the main factors in bringing the unusually good attendance. That the exhibitors did not really expect the show to pay for itself in the business drawn was demonstrated by the fact that an admission of \$1 was charged, a sum which made a gate sufficient to stand all expenses incurred.

"Blimp" a Prominent Feature

A huge "baby blimp" exhibited by the Goodyear company occupied the central part of the building almost to the exclusion of other exhibits, and around it were grouped several completely assembled airplanes and seaplanes. The tremendous

wing-spread of these exhibits took up so much space that the show gave an impression of bareness to the spectator.

War-worn "Spad" Attracts the Curious

Aside from the Goodyear "blimp," the chief exhibits of popular interest were the Curtiss Eagle, built to carry eight passengers, and the Aeromarine. Captain Eddie Rickenbacker's war-worn "Spad," in which he is said to have accomplished several of his twenty-six aerial victories, also drew crowds of the curious at each session of the show. Planes were also exhibited by the United States Army and Navy Departments.

Though exhibits such as the "Spad" undoubtedly appealed to the majority of visitors, many more technical treats were presented to the interested engineering observer. These technical features comprise the really important factors of the show, and include some particularly significant developments.

Technical Review of Aircraft

By Archibald Black

A DETAILED examination of the various machines at the show leaves the impression of a vast amount of thought having been expended on every design. Crudely developed fittings and details, frequently noted at previous shows, were conspicuous by their absence, and each fitting gave the impression of "belonging" where it was put. The exhibits were almost all of commercial types, and in most cases the designs were developed in every detail for this use during the past year.

A strong tendency towards the closing in of machines and the use of luxurious upholstery was evident. This tendency, as might be expected, is carrying with it the use of such equipment as reading lamps, cigar lighters, vanity cases, luggage compartments, etc. Reference to these items may amuse some engineers, but there is little doubt that the finishing and equipment of a machine has as much to do with the *first sale* of a sportsman's type as its performance. That this is coming to be recognized was evidenced by the remark (partly in jest and partly in earnest) of one engineer: "Whatever you do, don't forget to mention the cigar lighter."

Items of particular interest from the technical viewpoint, are the furnishing of a spare wheel on the Dayton-Wright model KT, the use of enclosed wing connections on the Curtiss Eagle and Oriole and the unusual aileron control of the Aeromarine. It is also interesting to note that the Curtiss company has adopted the monocoque fuselage for its sport and commercial types, and it seems safe to predict a great increase in the use of this type of construction for sport machines on account of its "clean" lines and the punishment which it will stand. The use of shutters in front of the radiators has become practically standard practice, and the installation of electric starters shows considerable increase in popularity. Streamline wire appears to be rather slow in coming into favor, it being used only on the Curtiss Eagle. Adjustable stabilizers are apparently becoming standard equipment, the control usually being by a hand wheel mounted at the left-hand side of the pilot.

Curtiss Eagle

The Curtiss Eagle exhibited was designed and built in 1919 entirely for commercial transportation. This machine is powered by 3 Curtiss K-6 engines, weighs, fully loaded, 7450 lb., and carries 6 passengers and two pilots, or 7 passengers and one pilot. The passengers and pilots are wholly enclosed in a monocoque fuselage, provided with celluloid windows and carefully streamlined. The seats are of wicker construction, with whip-cord upholstery, and are very comfortable, although the aisle between the two rows of seats is rather narrow.

One of the remarkable features of this machine is the extremely wide range of vision of the pilot, due to openings in the sides of the body near the front. Even the landing wheels of the machine are included in the pilot's range of vision.

The tachometers, oil gages and thermometers for the side engines are located inside the respective engine housings, instead of in the pilot's compartment, and are easily seen from the pilot's seat. The main gasoline tank is carried below the floor of the passenger compartment and a plunger pump, driven by an air turbine mounted on the left-hand side of the body, is used to lift the gasoline into a single gravity tank located in the upper center wing panel, from which it is piped down through a sight feed

glass mounted on the instrument board. The engine control levers are mounted on a board between the pilots' seats and are so arranged that either or both seats may be used for pilots.

The landing gear is quite original, as will be seen by reference to the accompanying photographs. Mud-guards of the motorcycle type are provided over the wheels.

Streamline wire with Hartshorn terminals is used throughout the wings. Aileron control wires are carried (exposed) along the leading edge of the wings and are not noticeable when a few feet away from the machine. Where these wires turn, from the leading edge of the wings, back to the ailerons they run over pulleys set into the leading edge so neatly as to be almost unnoticed.

The wing connections of the Eagle are entirely inside the panels and are reached by removing small triangular doors. This ingenious feature permits of eliminating the gap usually found between the ends of wing panels. The wing strut fittings, as will be noted from some of the photographs, depart from former Curtiss design.

Dual control is provided, so that two pilots may take the plane and relieve each other on long journeys. A number of the original features of this machine are shown in the accompanying photographs.

The Eagle has to its credit a record of 4400 miles flown and 933 passengers carried in less than two months, its first public appearance having been made on Sept. 27, 1919.

Curtiss Oriole

The Curtiss Oriole is a 3-seater biplane with a monocoque body, which was especially designed for sportsmen's use. The Oriole made its first flight on April 12, 1919, and a considerable number of these machines has already been sold. Two cockpits are provided, the pilot being seated in the rear while the two passengers are in front. The side of the passengers' cockpit is provided with a door to facilitate getting in and out of the machine. The passengers' compartment is provided with an instrument board carrying an altimeter and clock, and also with a control stick. A Bijur starter is installed just behind the propeller.

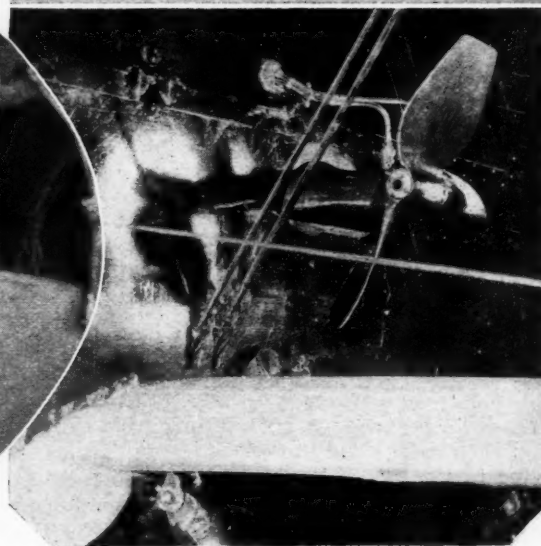
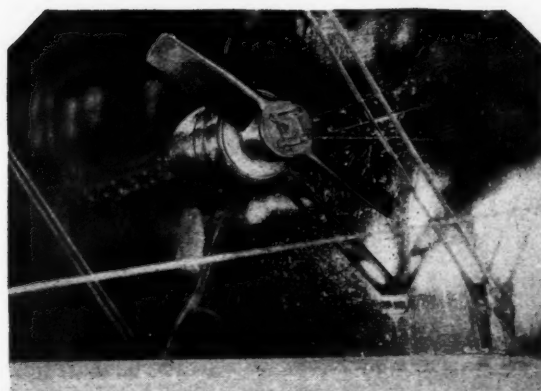
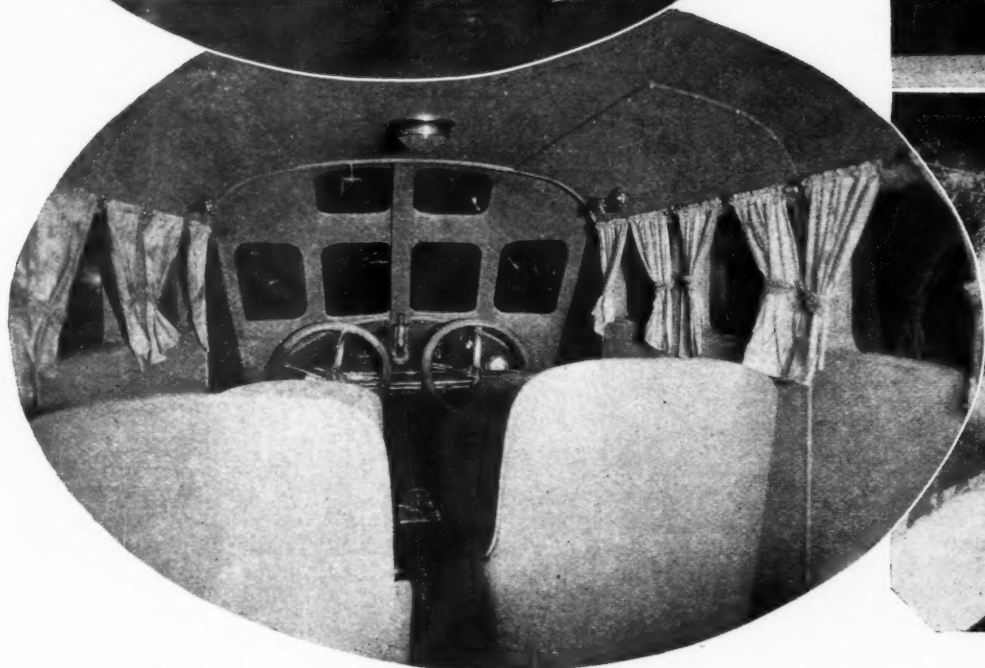
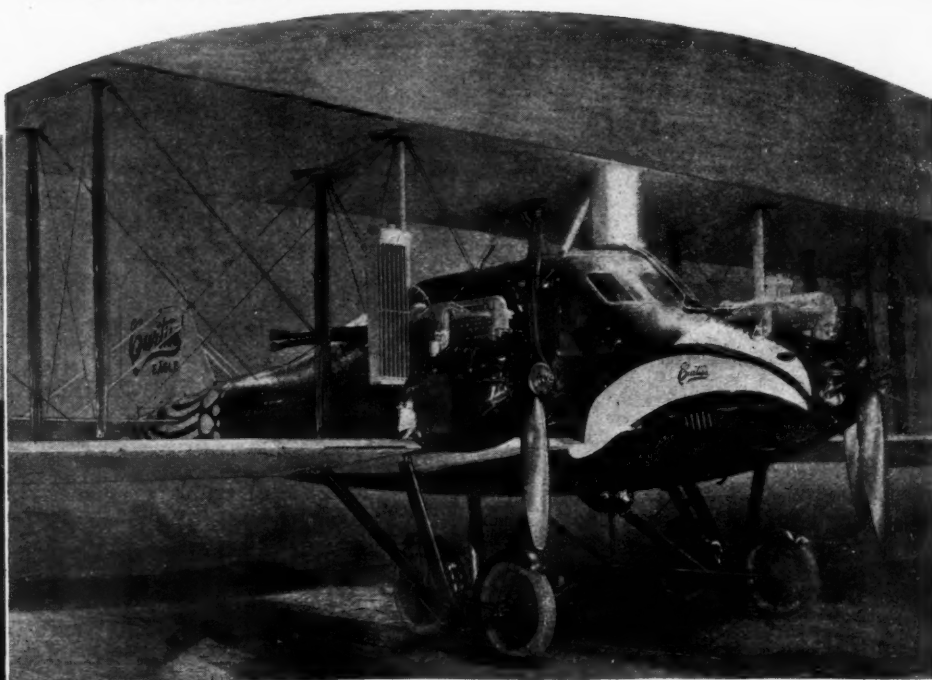
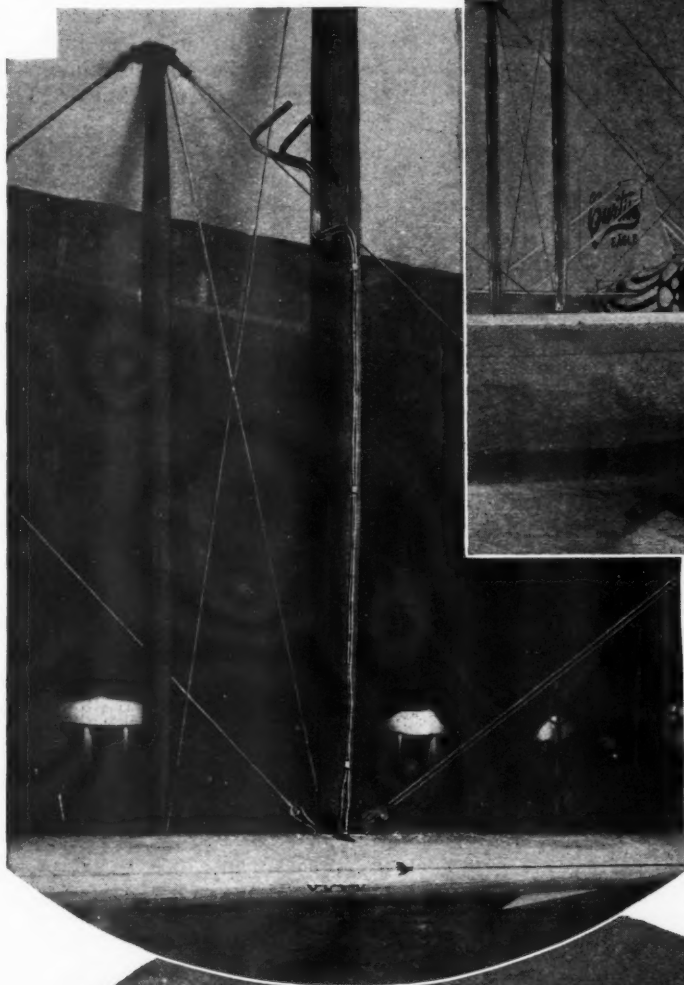
The wing connections of this machine are of the totally enclosed type, similar to those of the Eagle. The wing strut fittings are of the clevis-headed-bolt type instead of the drop forgings formerly used for this purpose on Curtiss machines. Ailerons are provided on both upper and lower wings; they are connected by a metal strap formed to streamline section, except at its ends, and the aileron control wires are carried exposed along the leading edge of the wings, as in the case of the Eagle. A gravity gasoline tank is carried in the upper center section of wing and a sight feed glass is located on the right-hand rear fuselage strut in a very convenient position.

Curtiss Seagull

The Curtiss Seagull is a 3-seater flying boat developed early in 1919 for commercial passenger carrying and sportsmen's use, and a number of these machines have been in service for several months.

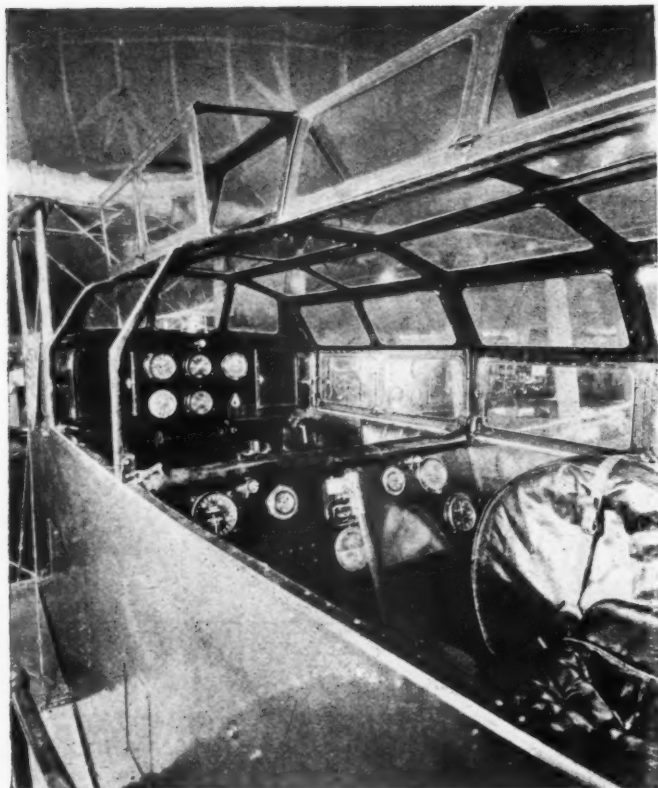
One of the unusual features of this boat is the form of the hull bottom, which is of the two-step type and strongly suggestive of H-16 or F-5-L lines. The Seagull is powered by a Curtiss K-6 engine mounted below the upper wing, following conventional flying boat lines. One of the notable details of this machine is the extremely large windshield, which runs across the full width of the cowl and is

Curtiss Eagle



(Upper left) Arrangement of independent static and total pressure heads of airspeed indicator. Note position of aileron control wire on leading edge of wing. (Upper right) "Close up," showing engine installation and landing gear. Note unobstructed position of radiators, arrangement of Bijur starters (in front of engine), duplex landing wheels with motorcycle type mudguards and triangular plates in wings enclosing panel connections. Opening near front of body gives the pilot an ex-

ceptionally wide range of vision. (Lower left) Interior, looking forward. Note artistic effect of curtains on side windows, whipcord upholstery and dome light. The valve handles, above pilots, control gasoline supply and the glass tube in center of instrument board is a gasoline sight feed gage. The engine controls, on a panel between pilots' seats, are just visible. (Lower right) Air turbine driven lighting generator. (Middle right) Air turbine driven plunger oil pump on left hand side.



Interior of Dayton-Wright Model KT. Note spare wheel and method of folding top

carried back several inches down the side in order to fully protect pilot and passengers.

Curtiss Motored Standard J-1

When the Curtiss company purchased last year, from the United States Army, a number of Curtiss engines and JN-4 training machines some Standard model J-1's were included in the deal. These machines have been overhauled, modified and provided with Curtiss OX-5 engines and a machine of this type was exhibited at the show. With the exception of the power plant and some minor changes the machine is substantially the same as when turned out by the Standard Aero Corp.

Curtiss JN-4-B

Several JN's were exhibited by the Curtiss company and, a number of these machines having been included in the deal previously referred to, are being offered by the Curtiss company at prices considerably below their original cost.

Aeromarine Model 50-B-2

One of the most striking exhibits at the show was the Aeromarine 3-seater cabin flying boat, Model 50-B-2. This machine is provided with an enclosed cabin having a door on each side. The top of the cabin carries out the streamline form of the hull very finely. The doors are constructed of 1-in. plywood glued and formed to shape while setting, the holes for windows being cut after the glue has dried.

The inside is finished in blue broadcloth upholstery and the floor is carpeted. The upholstering on the seats is extremely deep, making them very comfortable—probably even more so than a high-priced sedan. A number of refinements, such as pockets on the left-hand side of the body, drawers in the instrument board, vanity cases and a cigar lighter are included. Ample room is provided in the cabin and ventilators in the window lights used in conjunction with another ventilator in the rear of the roof insure fresh air at all times. Silk roller shades are in-

stalled overhead in order to protect the occupants against the rays of the sun at altitudes.

The wings and upper part of the hull are finished with high-gloss white enamel and the manufacturer's name is lettered in gold, making a very striking combination. An original type of aileron and elevator control is provided, all of the mechanism being located beneath the floor.

This boat is powered by an Aeromarine Model B 8-cylinder engine. The oil tank is mounted just below the engine. A 40-gal. main gasoline tank is located in the hull and the gasoline is lifted by means of a cup anemometer drive gear pump to a 5-gal. gravity tank in the upper wing section.

Dayton-Wright OW Coupé

The Dayton-Wright OW coupé is of the 3-seater type provided with an extremely large enclosed cabin, and its design is credited to Orville Wright. Automobile type pedals are used for operating the rudder in place of the customary rudder bar. Ample leg room is provided both for passengers and pilots. A single front seat in front is provided for the pilot and a double seat in the rear for the two passengers. A number of refinements, such as reading lamps, baggage space (covered by a curtain), vanity cases and a cigar lighter are provided. Very good vision is provided on each side, but the forward vision is not quite so liberal.

The nose of the machine is of unusual design. The propeller has an extremely large hub, and a honeycomb radiator with circular face (not unlike the type of radiator used with Salmson engines) is provided. The purchaser has the option of either the Hispano-Suiza 180 hp. or Packard 8-cylinder engine. The machine may also be furnished with a Liberty-6 engine at an increased price.

Dayton-Wright Model KT Cabin Cruiser

The cabin cruiser bears some resemblance to the inclosed De Havilland used by Mr. Lloyd George. This is a 3-seater machine, the two passengers being located in front and the pilot in the rear. A spare wheel is provided and located in the fuselage at the right-hand side of the pilot. The top of the cabin is of ingenious design, being constructed to fold up. The top frame is of aluminum, and triplex glass window lights are provided. Most of the pilot's instruments are duplicated on the passengers' instrument board, although single stick control only is provided.

The purchaser has the option of a Liberty-12 or Packard-12 engine.

A wing curve radiator of the Albatross type is installed in the upper center wing panel and is constructed of flattened brass tubes. Aileron wires are carried (exposed) along the leading edge of the wings, and a Zahm type of air speed meter is provided, the venturi being located on the intermediate front left-hand strut.

Inter-Allied Avro

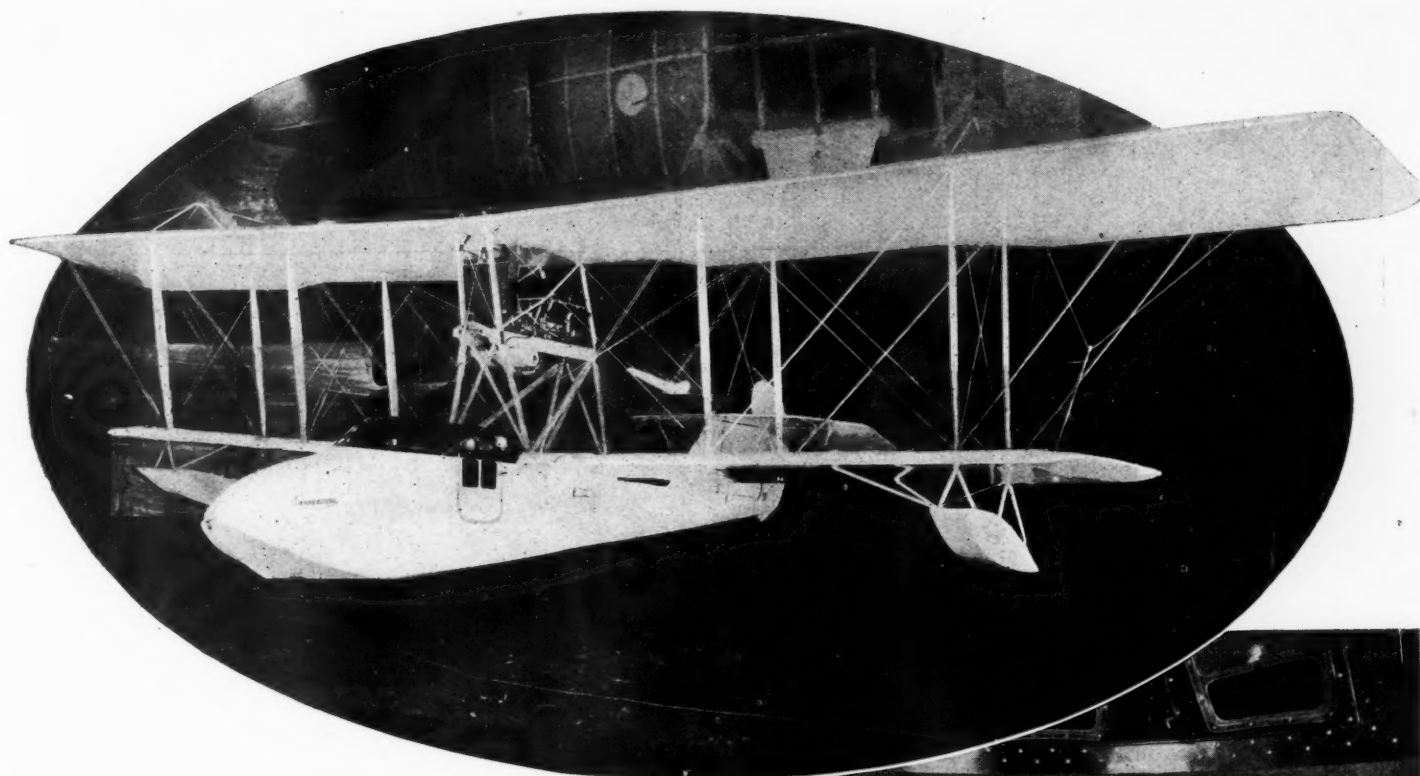
The Inter-Allied Aircraft Corporation exhibited one of the Avro machines which they are selling to sportsmen. This plane is of the land type, two-passenger, powered by a 110 hp. Le Rhone engine. It is similar in design to those used by the Allied Governments during the war, and the technical details are already well known.

United Aircraft Canadian JN-4

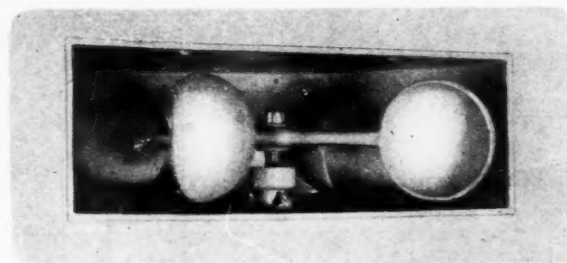
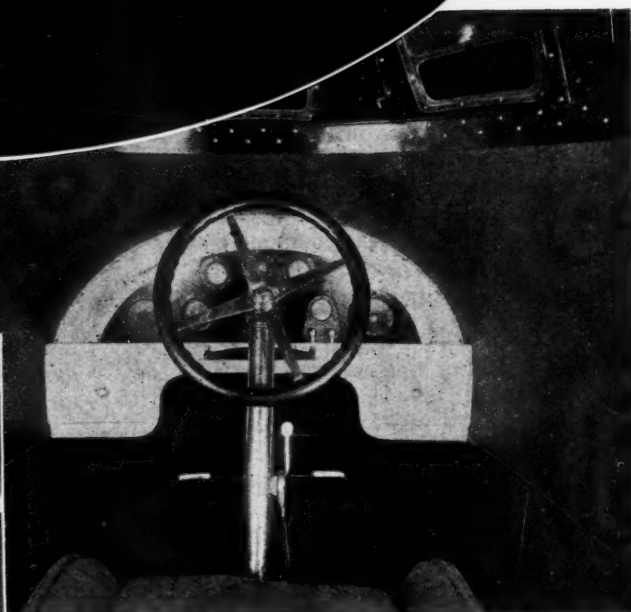
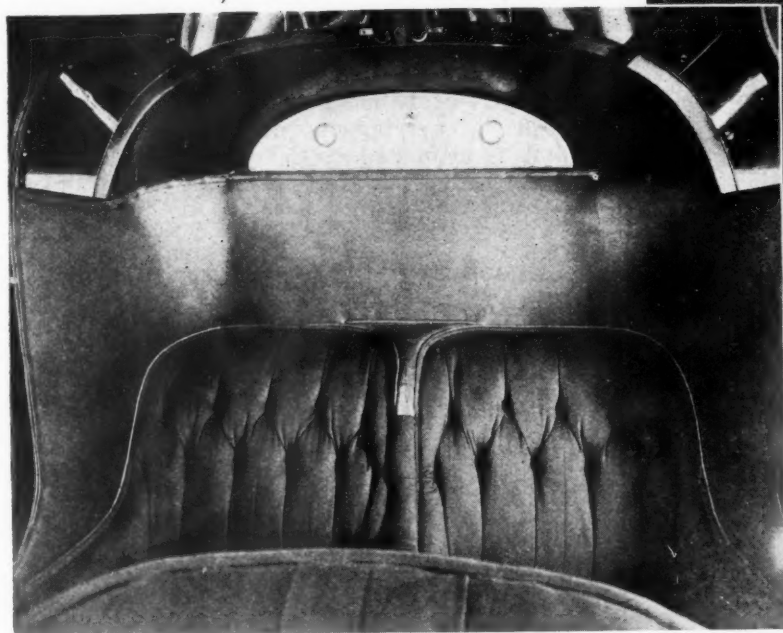
The United Aircraft, Inc., exhibited two of their Canadian JN machines. These planes are of the two-passenger land type, powered by Curtiss engines and very similar in design to the familiar American JN-4.

A. A. and S. W. Sport Plane

This plane unfortunately was exhibited without engine and gasoline tanks, as the company found it impossible to



Aeromarine Flying Boat Model 50-B-2

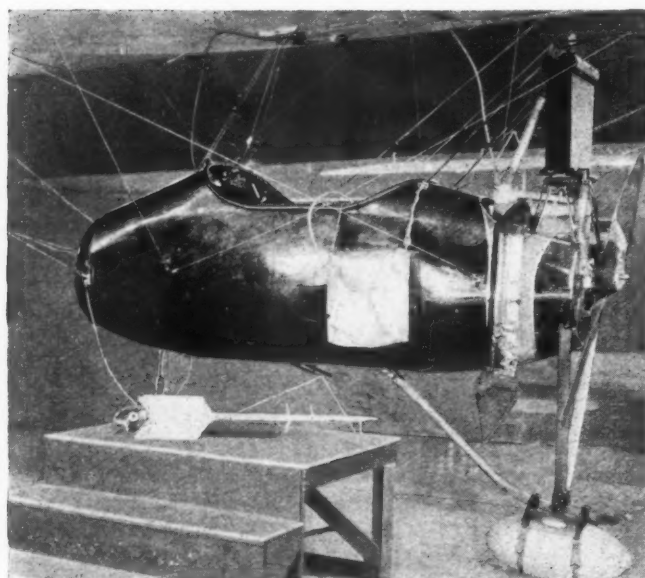


New Aeromarine 3-passenger flying boat 50-B-2. Note artistic lines of fireproof celluloid panelled top and door of cabin. The cup anemometer drive of gasoline pump, in side of hull, is visible just below wing. Note also port and starboard lights on lower wings near tips. (The airship in the background is the Goodyear pony blimp)

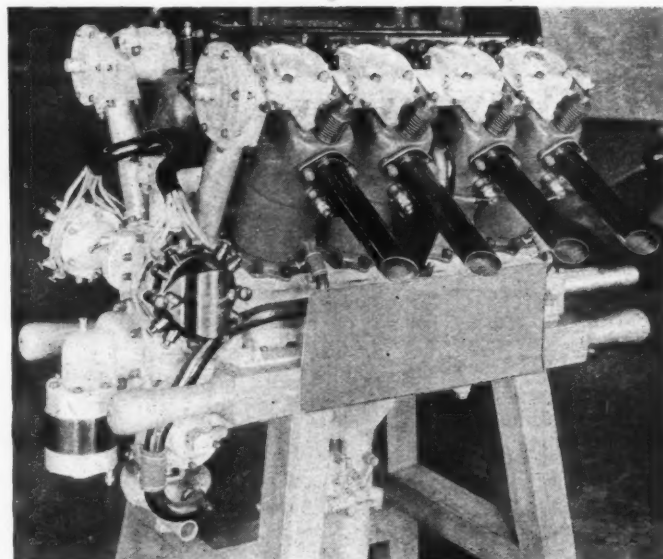
Interior of Aeromarine model 50-B-2 looking forward. Note ventilators in celluloid panels, drawers in instrument board and pockets in upholstery. The lever on column controls throttle, and the projections in the rim of instrument board contain shaded lights

Interior of Aeromarine model 50-B-2 looking aft. Note silk roller-shades on top lights, reading lamps and deep upholstery

Cup anemometer drive for gear type gasoline pump. Set into left-hand side of hull on Aeromarine model 50-B-2



Car of Goodyear Type A "pony blimp." Note bumping bag, skid protecting propeller, wire mesh over exhaust pipe and compact power plant arrangement. Bag on side contains a parachute



Packard model 1-A-744. This is a 4 1/4 x 5 1/4 in. 8-cylinder engine rated 180 hp. at 1600 r.p.m. Note position of generator and carburetor, also resemblance of valve mechanism to Liberty

complete the machine in time for the show. It is of 22-ft. span, of the single seat type, intended for sport use, and is to be powered by a 5-cylinder 30-hp. stationary radial engine, designed also by this company. The interplane struts are of the X type, constructed of steel tubing faired with wood.

Goodyear Pony Blimp

Goodyear Type A Pony Blimp is one of the smallest of modern airships and was produced by the Goodyear company especially for the use of sportsmen. It has a capacity of 35,000 cu. ft., making it slightly smaller than the Navy R type kite balloons. Its gross weight is approximately 2600 lb., light weight 1600 lb., and approximately 270 lb. of oil and gasoline are carried. Seats are provided for one pilot

and a passenger in tandem. The gas bag contains one central ballonet of 7000 cu. ft. capacity and a scoop adjusted to pick up air from the propeller slip stream is provided to inflate this ballonet. This scoop is provided with a fabric check valve, instead of the aluminum valves used on the Navy and Army airships. The power plant consists of an Ace water-cooled engine capable of delivering 40 hp. at 2000 r.p.m., direct coupled to a 6-ft. diameter, 30-in. pitch propeller. The power plant is mounted in the rear of the car.

The ship is estimated to have a high speed of about 40 m.p.h. and a range of 10 hours or 400 miles. Its static ceiling is 6000 ft., carrying one man and reduced fuel. Dynamic climb is estimated at 1500 ft. per min., either ascending or descending.

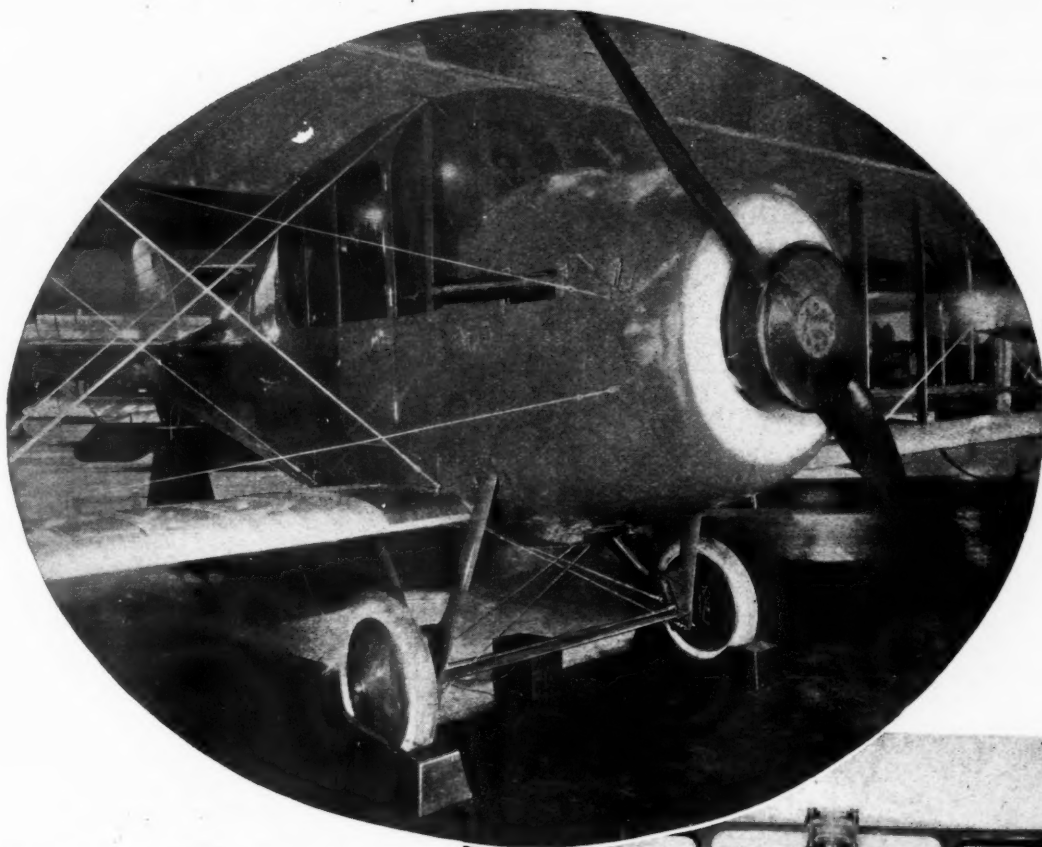
Technical Specifications of Airplanes Exhibited by Manufacturers or Sales Agents at Chicago Aero Show

Manufacturer (or Exhibitor)	Model	GENERAL						POWER PLANT			WEIGHTS IN LBS.				PERFORMANCE			
		Type	Use	Overall Dimensions			Crew and Pass.	Engines		Total H.P.	Empty	Gas. and Oil	Useful	Total Gross	High Speed		Low Speed, M.P.H.	Climb
				Length, Ft.-In.	Height, Ft.-In.	Width, Ft.-In.		Number	Make						M.P.H.	Altitude		
Aeromarine Plane & Motor Co.	50-B-2	TB Boat	P.	28-11	12-7	48-6	3	1	Aeromarine B.	150	2286	220	836	3122	...	...	...	...
American Aircraft & Supply Works	Sport-Plane	TB Land	SP	15-6	...	22-0	1	1	Own	30	300	70	220	520	*60.0	...	*26.0	...
Curtiss Aeroplane & Motor Corp.	Eagle	TB Land	P.	36-9	12-4	61-4	8	3	Curtiss K-6	450	5130	1000	2320	7450	107.0	...	54.6	10
Curtiss Aeroplane & Motor Corp.	Oriole	TB Land	P.	25-0	9-0	36-0	3	1	Curtiss K-6	150	1564	310	790	2345	96.0	...	51.0	10
Curtiss Aeroplane & Motor Corp.	Seagull	PB Boat	P.	28-10	11-9	49-9	3	1	Curtiss K-6	150	1957	300	769	2726	78.5	...	48.5	10
Curtiss Aeroplane & Motor Corp.	Standard J-1	TB Land	P.	26-7	10-10	43-11	2	1	Curtiss OX-5	90	1448	220	577	2025	68.0	...	37.0	10
Curtiss Aeroplane & Motor Corp.	JN-4-B	TB Land	P.	27-4	9-11	43-7	2	1	Curtiss OX-5	90	1535	150	490	2025	75.0	...	45.0	10
Dayton-Wright Div. of Gen. Motors Corp.	KT	TB Land	P.	30-2	11-2	43-7	3	1	Packard or Liberty	420	2686	869	1442	4128	120	...	55.0	10
Dayton-Wright Div. of Gen. Motors Corp.	OW	TB Land	P.	28-6	9-0	46-0	3	1	Packard or Hispano	180	1450	473	1042	2492	*95.0	...	*35.0	10
Interallied Aircraft Corp.	Avro 504-K	TB Land	P.	28-11	...	36-0	2	1	Le Rhone	110	1230	...	593	1823	90.0	...	35.0	16
United Aircraft, Inc.	JN-4	TB Land	P.	27-4	9-11	43-7	2	1	Curtiss	90	...	Ap	proxi	matel	y the	same	as Cu	rtiss

KEY: C.—Commercial.
P.—Passenger.
PB.—Pusher Biplane.
SP.—Sport
TB.—Tractor Biplane.

*Estimated.

Dayton-Wright Model OW



Dayton-Wright Model OW. Note propeller hub, ring shaped honeycomb radiator, window cleaner and size of door.



Interior of Dayton-Wright Model OW looking aft. Note baggage space covered by curtain and reading lamp overhead. The pilot sits in front and passengers behind.



Instrument board and pilot's windows of Dayton-Wright Model OW. The center window light of the machine at the show was equipped with a window cleaner.

Body Features at the New York Show

Numerous refinements and novelties are noted in the 1920 coach work by Mr. Mercer in his review of the Grand Central Palace exhibition. He does not note many striking changes and he attributes this to the unwillingness of designers to experiment under present labor conditions

By George J. Mercer

THE illustrations which are a part of this article feature the trend of the body styles exhibited at the Grand Central Palace show.

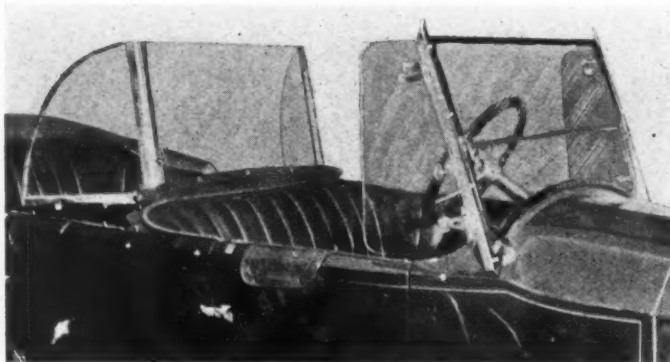
It is customary for manufacturers to show stock models, and once an attractive design has been produced by any manufacturer, it will be continued for more than one season. This is especially true at this time, because manufacturing has been conducted under abnormal difficulties and the demand has run ahead of production. For this reason new designs of bodies were shown only by those who brought out new chassis models.

Small Bodies Predominated

With only a few exceptions, all body models belonged to one or the other of the four popular types—touring, runabout, sedan and coupé. As usual, the touring bodies predominated, and the five-passenger bodies were more numerous than ever. In fact, on the main floor, by actual count, these small bodies predominated over the seven-passenger in the proportion of three to one.

There were a few close coupled four-passenger semi-roadsters and runabouts with comfortable disappearing seats, indicative of the tendency toward smaller, compact bodies for touring use.

In many new touring body models the length is accentuated by having the top line of the body continued



Wings on the tonneau windshield of the Roamer

through the hood line to the radiator. Saxon, Mitchell, National and Willys-Knight were examples of this practice. To produce this line on the hood a concealed hood hinge is necessary, and it was noted that Packard had adopted this type of hinge in place of the piano hinge. On two of the Packard models the hood line was further accentuated by extending the moulding as far as the radiator.

The top of the front seat looks best when inconspicuous, and the bodies with the cleanest cut lines carry the body line through without interruption at the point of intersection with the front seat. The best illustration of this point was found on bodies having the top edge flat or nearly so. The bevel edge has a tendency to link the body side to the seat line, especially when the second cowl is used. Judging by the new models exhibited, the popularity that the bevel edge has enjoyed for so long has commenced to recede.

A criticism is in order concerning the rounded top edge to the front seat back. Some jobs would look extremely well were it not for the heaviness of the seat at this conspicuous point.

Double Handles Common

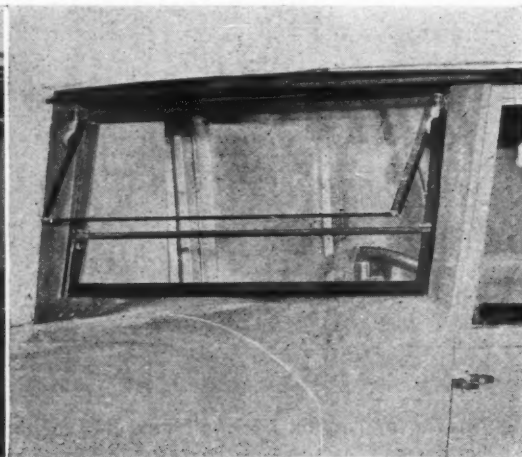
Both inside and outside handles are fitted on the doors of most open bodies. This is a move in the right direction, as it is necessary to operate the doors both from inside



Leather visor on the Hudson sedan



Brewster windshield on the Mercer Berline

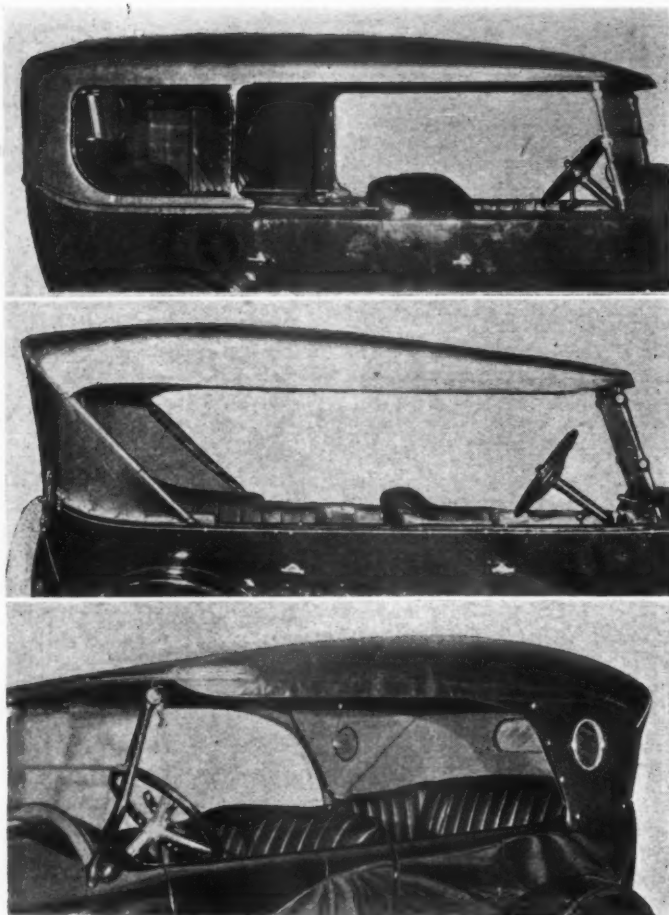


Windshield on the Cole sedan



The Packard Berline; Pierce close-coupled sedan; Peerless close-coupled touring body; Chevrolet coupe; Studebaker coupelet, one of the few at the show; Packard

coupe, showing moulding across engine hood; Willys-Knight five-passenger, showing new model with body line through hood, and the Marmon town car, one of the few cars of this type shown



Top picture shows the California top with glass windows on the Cole. Center picture—New design top on the Saxon five-passenger. The Apperson shows quarter curtains on its top.

and outside, on account of the curtains. Quite a number of these inside handles were of the inverted hook shape, in place of the slider plate and lever handle. The outside handles were of the straight bar type, and those with black finish looked most attractive, being less conspicuous than the nickle finished ones on any body color. Concealed hinges predominated over the visible type.

The most popular door construction was the overlap panel type; some few used a flush door and there were several doors on which moulding covered the joint.

Instrument boards were well placed, just far enough under the cowl to avoid the instruments being noticeable from the side, and the finish was usually either black or natural wood, while a few cover the board with leatherette.

Windshields All Slanting

All windshields were slanting, and several had the lower member stationary and a rubber band permanently set to keep out the rain. Of course, a ventilator is provided in the cowl in connection with this type of shield. This looks like a good plan, but it is questionable whether it will meet with the favor that its merit warrants.

Many of the folding seats on seven-passenger bodies were visible when folded down, no elaborate housings being provided to receive them, as in former years.

Tonneau lights were used on many of the five-passenger bodies, and these were located in the back of the front seat near the top line, and flexible robe rails were used more than ever. In former years every touring body was equipped with a foot rest, but this year more than half of the five-passenger bodies were without such equip-

ment. The Willys-Knight had a permanent board that served as a cover for a tool kit as well as a foot rest.

The trimming design was the regulation straight pleat. One job on the main floor used pigskin plain. The cushions were generally thicker than in former years, 6 in. thick on the average, and the pleats were continuous, no facing being used.

Small trimming rolls were the usual thing on the back seat when the top was made with the gipsy quarter, and most tops were so made. Rolls on the front seat were only seen on cars that were designed several seasons back. Rear seat backs were high for comfort and those extending above the body line were concealed by the top.

Tops of Various Designs

With few exceptions the tops were of the familiar designs. The Saxon showed a new type in which no bows show forward of the quarter, and the Cole was one of several featuring the California top. The Cole exemplification of this type had glass windows on the side that covered about two-thirds of the open space from the back forward, the balance of this space being covered by a roller curtain concealed in the top lining and fitted with celluloid lights. The side glass was in two parts and the whole could be lifted out for summer weather, but when in use the rear quarter is stationary and the other moves from a pocket on the inside of the stationary glass, sliding in a groove and covering a space just forward of the rear door, being moved back when the door is opened.

Some form of top of this nature is almost certain to take the place of the demountable top formerly so much used. One other top had detachable curtains for the quarter, which when in place gave the appearance of a Victoria. This was designed to replace the gipsy, and looks much better, but it cannot be always in place as the latter is. The Oldsmobile had an arrangement whereby the top support could be removed when not in use and a cap was fitted over the end of the body iron.

Runabouts were shown in considerable number, as compared with former years, and the illustrations show the variety of designs.

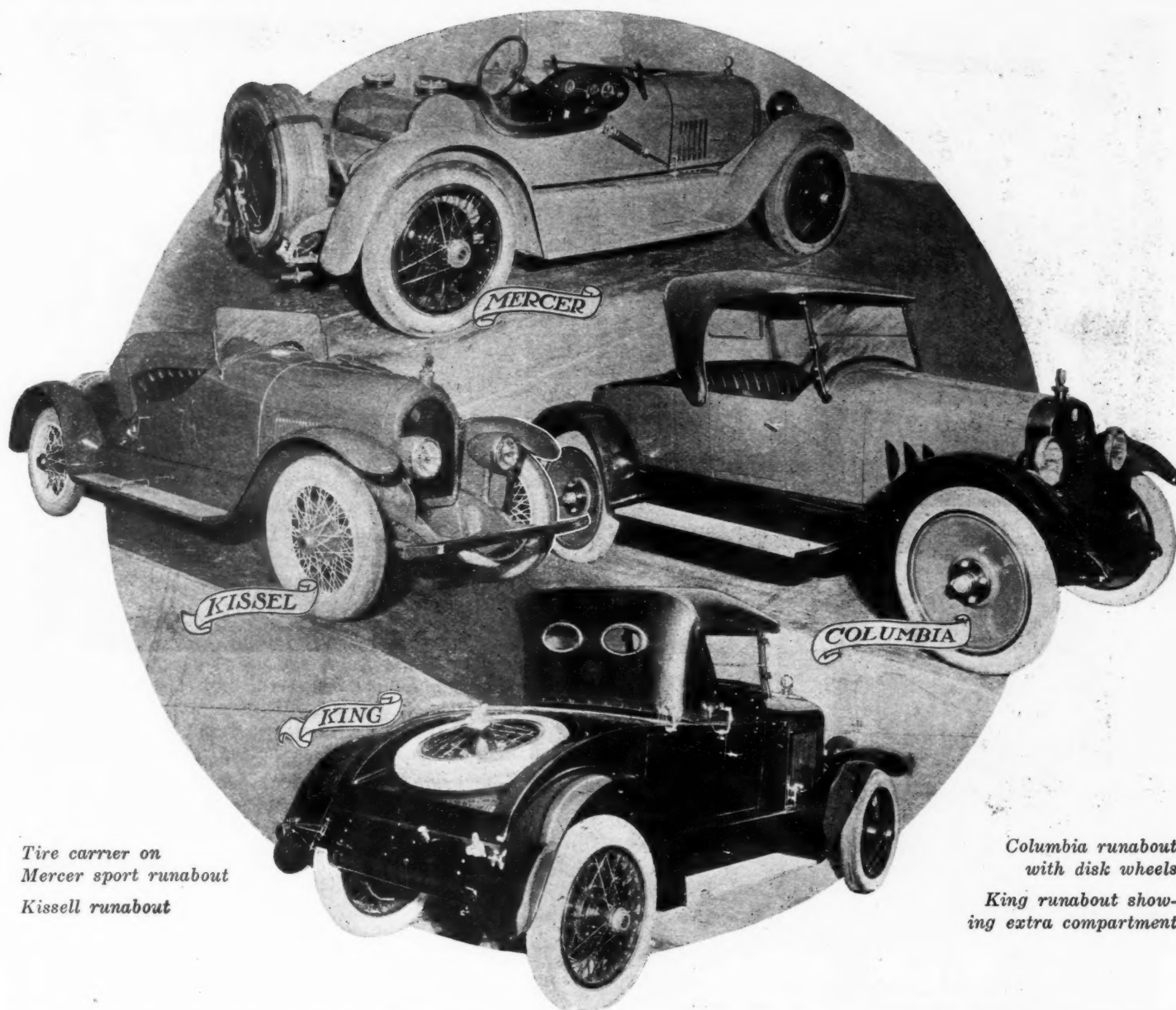
Sedans Mostly Five Passenger

The sedans, like the touring bodies, were principally of the four door, five-passenger type—another sign that this is a small body year. There was also a marked change from the slanting to the straight front on these jobs. Taking the exhibits on the main floor, the proportion of straight fronts to slanting was almost three to one. This leaves out of account the V type, which never reached a high degree of popularity and which was represented in about the usual number.

On the straight front, the line departs about $\frac{5}{8}$ in. from the perpendicular in the distance from the belt to the top, and on nearly all these bodies the glass visor has been replaced by leather. This leather is really a curtain, and is made to roll up when not required to keep out rain or the sun. It is buttoned over iron brackets, and there is a strap on the under side for rolling it up. It is permanently fastened at the rear to the body or the under side of the top. When a curtain of this description is used the top extension is made smaller than with a glass visor. Obviously, the solid nature of the leather will give substance to the front that is lacking with glass, and the same overhang as with glass would look out of proportion.

The Use of Mouldings

The popular design of sedan was the straight line type, and mouldings were used liberally but not excessively. Mouldings, when correctly applied to this type of body, impart an air of lightness. This does not apply to open



Tire carrier on
Mercer sport runabout
Kissell runabout

Columbia runabout
with disk wheels
King runabout show-
ing extra compartment

bodies, nor does it apply to all closed jobs, but on sedans there is an opportunity to link the entire length of the hood to the body in this way, and by creating the impression of length, the appearance of height is lessened. The roof line is flat, the lower line of the windows is carried up and the total impression of the car is that of a low and rakish construction.

On most bodies the door windows dropped flush and the doors averaged 25 in. in width of opening. The rear corner of the body, when round, had a smaller radius than usual, sometimes of 3 in., while on other bodies the corner was square. The elimination of the slanted front tends to make the body more compact looking. There were two double compartment bodies or berlines using the Brewster windshield, and the Cole used the Rubay. The rear window was large in all cases, 26 in. being the average width.

The interior of these five-passenger bodies was commodious. Height was scaled down to get the low effect, but no dimensions were cut so as to affect comfort. The interior appointments included a flush type floor heater, dome and corner reading lamps and vanity cases on about one-half of the jobs.

Interior Fittings

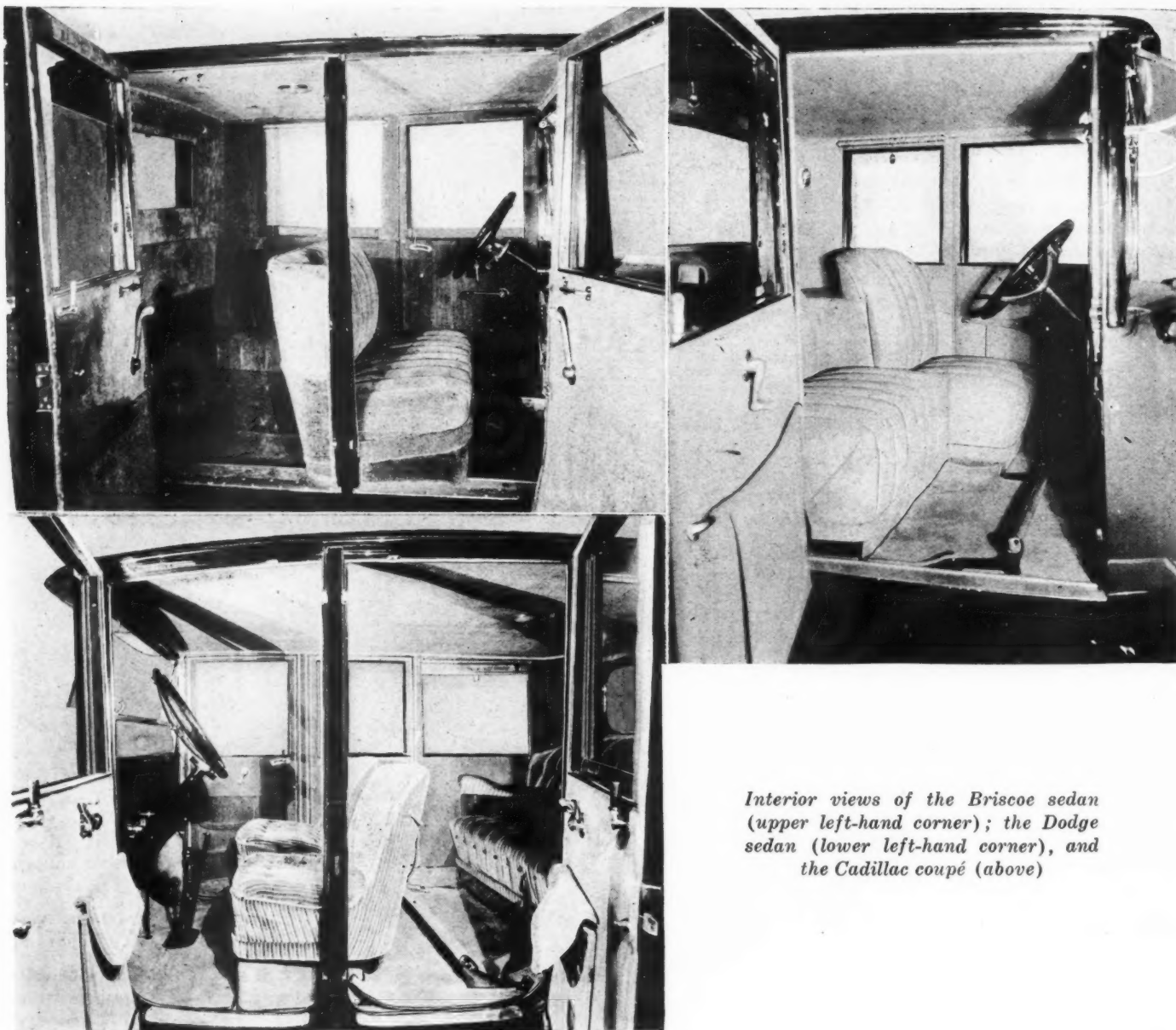
The interior effect on these small sedans is very plain. There are no trimming pleats on the rear side quarters;

except for an arm rest, the side is plain up to the back. The switch plates are located lower down than formerly, many in the heel board on the right side below the cushion. Many of these bodies were without pull-to handles, the regulator handles serving the double purpose. This seems reasonable, for by reinforcing the handle where it fastens to the bar, it can be made to fulfill satisfactorily all requirements. In about one-half of the models curtains were used on the rear doors and on about one-half there were curtains on the quarters and back windows only.

Among the door handle types the favorite was the black straight bar; there were also some drop handles, but the bar handle lends itself better to straight body lines. Outside hinges were universally used. The use of pillows at the rear seat and carpet hassocks for foot rests has come in to some extent. The mirror at the top in front was universal, and the instrument board served as the mounting for the clock and cigar lighter.

Trimming Materials

The idea of trimming the front seat with leather has gained some adherents, but the majority used the same material for both seats. Of the trimming materials, the velours, plushes and mohairs were most in evidence. Broadcloth of a dark shade was used to some extent, and there was a fair sprinkling of wool fabrics of mixed colors.



Interior views of the Briscoe sedan (upper left-hand corner); the Dodge sedan (lower left-hand corner), and the Cadillac coupé (above)

It would seem that this latter material was best suited for a general body of this kind.

No doubt, the scarcity of all materials has had a great deal to do with the selections made, and, besides, show jobs are dolled up for the occasion. The velours were generally of two colors, stripes being used on the seats and backs, and plain material above and on the doors. Rope robe rails were used entirely, and there was a general improvement in the character of the hardware of the interior mountings, dull silver finish being most used, and all the pieces being of harmonious design, as a rule.

One trimming design was used almost exclusively, namely, the plain pleat. Among the few exceptions was a design having a single row of buttons on the back and cushions. There were pockets on all four doors, as well as regulators. The quarter windows were operated by a strap.

On the seven-passenger bodies the folding seats were either visible or of the sliding type that fold under the driver's seat.

Four-Seated Coupés

During the past year a definite conception has been formed as to what the public requires in a coupé. This should be a three or four-passenger job, preferably a four,

because the four is only slightly larger than the three and can be a three or a four. The additional seat is the regulation folding seat used on seven-passenger bodies, and is made to fold under the cowl when not in use. The rear seat is comfortable for two. One-half of it is offset enough to gain leg room back of the folding seat, and the space at the left side back of the driver's seat is used for a package compartment.

Coupés as Owner-Driven Cars

The coupé is virtually a miniature sedan and serves the purpose of an owner-driven town car. Being small, it can be made with the overlap panel, and heaviness of appearance is not fatal to it, as it is to the sedan. As a rule, the buyer expects to save money by purchasing a coupé in place of the large car, but as a matter of fact, the manufacturing costs are nearly equal. Sometimes the upper part, including the top and back, are covered with leather or leather substitute, to save cost, but there were very few so made at the show, the panel back being the rule.

The slanting front does not lend itself well to this short body. The doors are large, 27 in. being the usual opening width. The steering wheel is usually further back from the dash than in a touring car or sedan, and the extra cowl length permits of blending the wide body into the

dash. The entrance on the left side must be sufficiently wide to permit of sliding under the wheel easily.

Interior Appointments of Coupés

The interior appointments are confined to the mountings on the instrument board. There are pockets in the doors and flexible robe rails at the same place. The single dome light is placed well back, the rear window is large, the quarter window and the door drop full length, and curtains are used on the back and quarter only. The best cars use a heater of the flush type, and the leather visor is used the same as on the sedan.

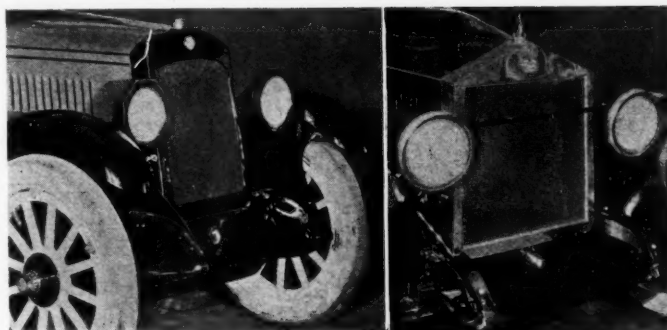
Trimming materials were the same as on the sedans. One job used morocco, and there were also examples of the use of leather for the driver's seat and cloth for the rest of the car.

The rear end of the body was finished by a hamper extension that covered the chassis frame and was made as commodious for carrying purposes as possible. In the past, the rear body corner has been well rounded, but there is now a tendency to reduce the radius, and in some cases a square corner is used, with a square edge also for the hamper. Mouldings are not used to any extent on these bodies, as the design naturally calls for refinements, and anything sporty or rakish is entirely out of place.

Higher Radiators

Radiators have been slowly increasing in height. On practically all the new models endeavors have been made to extend the body line across the hood, and good illustrations of the manner in which this was accomplished were given in the early part of this article. It is true that the round top radiator has numerous adherents, and clever body designs are based upon it. Still, the public wish to see straight lines, clean cut and as long as possible, and this can only be gained at the expense of the rounded radiator. The Mitchell used a slanted front radiator for the first time, the idea being to have the windshield and radiator in the same plane. There were fewer V front radiators than ever.

The cause of clean lines could be helped along a great deal if the engine hood, where it rests on the cowl, were in the same plane as the cowl sheet. On high priced cars this point has been gained, but the manufacturing difficulties prevent its general adoption. This is one of the weak points on the majority of cars. The louvres on the sides are generally of the long, narrow kind, and there were several using the inverted louvre seen on the Winton at



New style radiators on Mitchell and Moon cars, in the order named

the last show. There were two new designs having louvres in double rows.

The full crown fender has become practically standard, and there were many beautiful designs in which the border was developed and ended in an ogee shape. All fenders are more substantial than formerly, the shape being strong and the contours harmonious. The same can be said of most runboards.

Tire carriers were uniformly at the rear and of very serviceable design.

Color Combinations

The color combinations were not noticeable for variety; the general effect was sombre, striping being confined to open cars, with rare exceptions. Where striping was used, it was usually limited to a single line along the top edge of the body, and in some cases on the hood. There is a general tendency to use black radiators, owing to the manufacturing advantage, and black fenders are used for the same reason. The wheels are a part of the car calling for relief, either in color or stripe. Wire wheels do not look as well when all in one color as when the spokes are one color and the hubs another.

There is such an opportunity to use two colors on the wheels that it is strange that this is not more often considered for show work. It is sufficient to simply have the metal flange a different color. Lakes, soft tones of red, green and blue, showed to greatest advantage as body colors, when relieved with striping or other shades. The closed cars were uniformly black above the belt line, when constructed with the overlap panel. On bodies that had moulding, the body color was continued on both upper and lower panels and relieved with black mouldings.

Disabled Soldiers Train for Automotive Work

THAT the knowledge and popularity of automobiles increased greatly during the war has been indicated by many recent developments. The interest which the war veterans are taking in the automotive field is strikingly illustrated by figures recently published by the Federal Board of Vocational Education. The statistics list the number of men taking the various courses offered to disabled soldiers, sailors and marines under the Vocational Rehabilitation Act.

Out of a total of 18,239 men taking these courses, which cover every branch of hand and brain work, from the building and mechanical trades to advertising, engineering, art and medicine, 1257 are preparing themselves for work in automotive trades. These men will become automobile mechanics, drivers, repairmen, tractor operators, etc. Only one other group of courses, the general farming courses, have attracted a greater number

of men. Engineering, for instance, attracted 957; advertising, 147; building trades, 266; bookkeeping, 225; etc.

The special automobile courses number six out of a total of some 260 courses. Thus the automotive trades are seen to have attracted about 7 per cent of the total number of men to whom this wide choice was open. Agriculture, its only superior, has about 10 per cent. Moreover, the entire number of these men actually training for automobile work is not included in the 1257, for many who are training as salesmen, factory managers, office managers, etc., will undoubtedly find their way eventually into automobile work.

While the number of disabled men being trained is not so large as to be of importance to the industry as a whole, the figures are significant of the importance which is being given to the automotive industry by men who were in the war.

Analysis of German Trucks by the Motor Transport Corps

This article continues the report on the trucks surrendered to the A. E. F. under the terms of the armistice. The results of the investigations and tests are being made public as soon as they are completed for each truck

By C. R. Hays*

Saurer

Motor

Four cylinder, T head, cast in pairs, 3 5/16-in. x 5 5/8-in. bore and stroke, 3-point suspension, single piece crankcase.

Cylinders

Cylinders are held down by six 1/2-in. studs. Combustion chamber is flat type counterbored. Cylinders counterbored at bottom with 3/8-in. walls. Valve guides are 4 1/2 in. long, cast iron and pressed into the cylinders. From 1 in. at each end of valve guide on the inside the guides are recessed, this making contact on the valve stem only at each end of valve guide. A single port for two valves, both intake and exhaust. The water enters on the exhaust side, rising around valve seats, and is discharged on top of the cylinders. Water jacket runs half way down length of cylinders with exceptionally large water areas around the valve seat and overhead. The cylinder walls are cast together, therefore no water between the two cylinder walls. Priming cups are located directly over the combustion chambers. The intake and exhaust ports are very symmetrical and smooth, as though sandblasted. Exhaust manifold is of cast iron held on by studs and flanges. Intake manifold is of cast bronze with very symmetrical curves.

Flywheel

Flywheel is of cast iron and pressed on crankshaft; 19 in. dia. and 4 1/2 in. wide. The rim is 1 3/4 in. thick counterbored 3 3/8 in. deep. The flywheel rim is cast integral with a six arm spider.

Crankcase

Crankcase is of one piece aluminum casting, very heavily ribbed and reinforced especially at the three bearings. This case is very difficult to cast, although it shows best type of structural features; was evidently cast by specialists in this line of work.

Crankshaft and Bearings

Crankshaft is a rough forging. Short and long cheeks are 1 1/8 in. x 2 1/2 in. Fly wheel is pressed on to the crankshaft and held by straight key and nut. The front bearing has eleven 1 1/16-in. ball bearings, the center eighteen 15/16-in. ball bearings and the rear eighteen 15/16-in. ball

bearings. The outer race of the front bearing is 5 1/2 in., the center 6 3/8 in. and the rear 7 1/4 in. The outer race on the rear bearing is thicker than the race on the center bearing. This accounts for the two outer diameters being different in size when eighteen of the same sized balls are used. These bearings are of the annular type with the front, center and rear outer races pressing directly into the crankcase. The inner race of the front bearing is pressed onto a raised boss on the crankshaft. The inner race of the center bearing is pressed onto a raised boss on the crankshaft and held on by a spanner nut. The inner diameter of this race is large enough so that the bearing can be slipped around the throw of the shaft. The rear bearing is fastened upon the shaft in the same way as the center bearing. The outer races are held into the crankcase by elliptic spring locks.

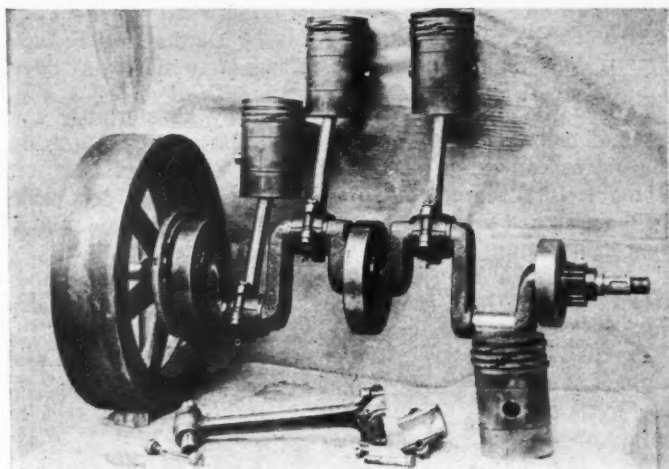
Connecting Rods and Bearings

Connecting rods are offset drop forge I-beam type, rough. Connecting rod bearings are 1 3/4 in. in dia. x 2 3/4 in. long, babbitt lined and bronze backed, held into the cap by dowels. In the bronze backing are two 1/8-in. x 1/16-in. recess grooves, running around the backing on the inside. At each end of the bronze backing is a V-shaped groove. When the babbitt is poured into it it runs into the straight recess grooves, also the V-shaped grooves at each end. This locks the babbitt thoroughly into the backing. The caps are held by two 7/16-in. bolts with oil scuppers on the caps. Over the top half of the bearing are located four 3/16-in. oil holes. The wrist pin bearings are bronze bushing pressed into the connecting rod with an oil pocket and hole on top of rod for lubrication. No shims are used.

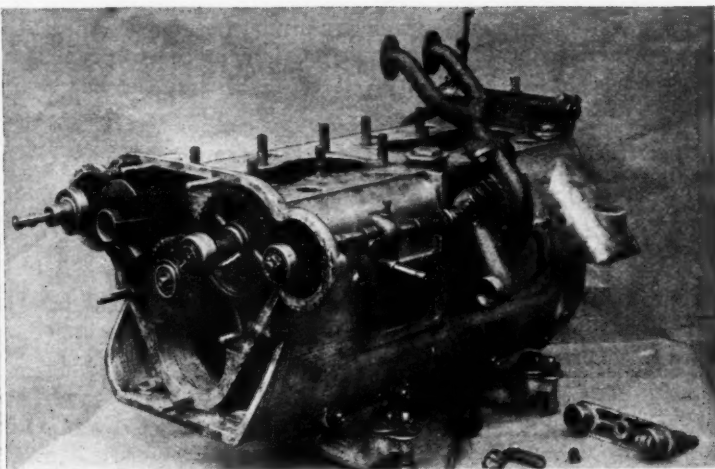
Pistons and Pins

Pistons are cast iron, flat head with a 3-in. dia. 7/16-in. high dome in the center. Piston is 7 in. long with four 1/4-in. hammered lap joint, concentric compression rings. Rings are held in place by dowels on bottom edge of ring. There are two oil grooves in the skirt of the piston and a 1/8-in. x 1/4-in. rib at bottom of the skirt, the skirt being 2/8 in. thick. In the inside of the piston, under the head, are the cross type ribs, 1 1/2 in. wide. The piston pin is located 4 in. from the top of the piston. The piston pin is of steel tubing, hardened and ground. At each end there is a taper counterbore extending 1 in. in length. Running 3/4 in. from each end are four 1/32-in. milled

*Mr. Hays is chief of the experimental section, Motor Transport Corps.



Saurer crankshaft, flywheel, connecting rods and pistons



Saurer crankcase, showing water pump, oil pump drive on water pump shaft and timing gears

slots. Running through this piston is a stud bolt with a long taper nut on each end. By screwing up these nuts with a screw driver on to the stud the piston pin is expanded and locked into the piston.

Timing Gears

Timing gears are of the spur type. The timing gear on the crankshaft is 2 13/16 in. outside dia., having 22 teeth 1/4 in. deep, 3/16 in. thick at base of teeth and a 1 1/4-in. face and is of steel not hardened. The two camshaft gears are of cast iron. The idler gear is of soft steel sides and fiber center. The magneto and water pump gears are of fiber. The idler gear, pump gear and magneto gear are each carried on two ball bearings.

Camshaft and Bearings

Camshafts are of hollow steel with the cams forged integral with the shafts. The shafts are hardened and ground all over. The outside diameter of the shaft is 1 1/32 in. The base circle of the cam is 1 5/16 in. in dia., 1/2 in. face, 5/16 in. lift. The exhaust camshaft has one rear and two front ball bearings 4 in. apart. The intake camshaft is supported by front, center and rear bearings. On the timing gear end of the exhaust camshaft is located a bronze bushing 4 1/2 in. long. The outside of this bronze bushing has a two-way spiral spline, which goes through the hub of timing gear by a bell crank at rear of the motor, and a rod connection running through the hollow camshaft. This bronze bushing is forced along the camshaft. As the timing gear cannot move its position, the camshaft is advanced 90 degrees. This operation is from the dash and is used as a compression release. The shaft can also be advanced while the motor is in operation.

Valves

The valves are mushroom type, crown head, 1 7/8 in. in dia. with a tapped hole in the head for inserting a bolt to pull the valve out or to be used in grinding the valves. The seat is 3/32 in. wide and flat. The stem is 8 in. long and 3/8 in. in dia. The valve springs are held in place by machined cap and key, going through a broached hole in the valve stem. The valves are interchangeable. The valve caps are cast iron with copper gasket on the seats. The valves are protected by covers.

Valve tappets are the roller type with a compression spring to keep the tappet following the cam. The tappet body proper is 15/16 in. in dia. and 1 1/8 in. long, recessed

down, forming a stem 3/8 in. dia. and 2 3/4 in. long. The adjusting tappet is screwed down upon the tappet stem and locked with a jam nut. The tappet guides are of cast iron 3 in. long, in pairs and held down with 1/2-in. studs.

Governor

Fly ball type, operating on the inside of the intake camshaft gear, connected with a rod that runs through the hollow camshaft to a bell crank on the rear of the motor; from the bell crank by a rod to the governor valve.

Oiling System

Oiling system is a splash feed; scuppers on the end of the connecting rod. The oil is supplied by a four plunger pump located on the frame of the truck which draws its oil from an auxiliary tank, forcing the oil through leads to four oil troughs in the crankcase. The oil is kept at a constant level in these troughs by the pump. The oil pump is driven by a worm gear and shaft from the water pump shaft.

Water System

The water pump is a centrifugal pump, 4 in. in dia. with bronze impeller and body, the water entering in the center of the pump and discharged on the center overhead through a Y-shaped manifold. The intake and discharge are 1 in. The water pump is fastened onto the side of the crankcase and is driven by shaft and spur gear in the timing gear case.

Ignition

Ignition system is a single system, high tension, type Z. U. 4 Bosch magneto. A continuation of the armature shaft allows for inertia type governor. This governor is used to advance the armature in the field instead of the customary practice of advancing the breaker box. For checking up the secondary rotor a celluloid window is located opposite contact number one in the secondary distributor cover. Magneto is located on the right-hand side of the motor, and is driven by a gear attached to the end of the armature shaft meshing directly into the camshaft gear.

Carbureter

Carbureter is a vertical Pallas, type V, 1 3/4 in., with a 29 mm. venturi throat. The float is of cork and shellac. The idle adjustment is by a stationary well. The carbu-

reter is cast aluminum, with no special features. The high speed is through a well, running angular through the venturi, the fuel being restricted by a compensator. The throttle valve is a butterfly type. Carbureter has a hot air attachment.

Fan

Twenty inches in diameter. Four blades. Material sheet steel. Mounted on a steel hub with machined fan pulley on rear end. The fan shaft is made of steel, having a large hub with vertical shaft at right angles to fan shaft and mounted on ball bearing in fan hub. The adjustment of the vertical shaft is taken up in the fan shaft boss, which is cast on front end cover. This boss has a $\frac{1}{8}$ in. slot, having a boss for clamp bolt.

Weights

Piston, $6\frac{3}{4}$ lb.
Connecting rod, 6 lb. 14 ounces.
Valve tappet assembly (cast in pairs), $2\frac{1}{2}$ lb.

Valve, 6 ounces.

Valve spring, 3 ounces.

Remarks

This motor evidently was designed by an engineer who has had considerable experience on the practical details, especially from a service standpoint. All parts that can be made interchangeable are so constructed. All parts are easy to get to and disassemble, excepting the connecting rod bearings. These bearings can be either adjusted by small port holes on the side or by lifting off the cylinder blocks. In case of breakage of the ball crankshaft bearings they can be easily replaced. This motor can be easily disassembled from the chassis, being very small and compact. All parts show good grade of workmanship. The crankcase and timing gear cases are masterpieces in aluminum casting. Every bearing is of the ball type, excepting the connecting rod bearings. Even the starting crank has ball bearings. On the exhaust manifold is located a ball check valve for supplying pressure on gasoline tank.

Vomag

Motor

Four cylinder L head, $4\frac{3}{8}$ in. x $6\frac{1}{4}$ in. bore and stroke, three-point suspension, suspension by the lower half of the crankcase. The front suspension is set on the cross member of the frame.

Cylinders

L head, cast in pairs, with valves located on the right hand side of the motor. The exhaust ports are on the right-hand side with intake ports on the left-hand side. Pockets under the valve seats are exceptionally large, as the intake passage expands into a fan shape. The intake and exhaust passages are symmetrical and very smooth, as though they had been sandblasted. The water enters on the valve side, completely surrounding the valve seat and a large portion of the guides, and is discharged through the top and the center of the motor. The water area around the cylinders, especially overhead, is exceptionally large, the cylinder casting being flat on top. The valve guides are cast integral with the cylinders. The water jacketing runs down half way the length of the cylinders. The combustion chambers are a flat type with no counterbore. The cylinder walls are $\frac{7}{16}$ in. thick and counterbored at the base, and milled on each side for clearance of the connecting rods. The bases of the cylinders are cast together, $\frac{15}{16}$ in. thick. At the base of the cylinders, instead of the customary practice of a small fillet, these cylinders are very heavily tapered, making them $1\frac{1}{4}$ in. thick from the outer edge of the base to the inner cylinder walls. These tapers run out 2 in. from the base of the cylinders.

Flywheel

The flywheel is made of steel casting, having a rim that is cast integral with six fan-shaped fins. The diameter is $20\frac{1}{2}$ in., width 4 in. The rim is machined to a depth of $1\frac{1}{2}$ in., which allows the cone to ride partly on flywheel and cone flange, which bolts to rim of flywheel.

Crankcases

The upper half of the crankcase is of cast iron with $\frac{5}{16}$ -in. walls. It is very heavily ribbed and has two small inspection holes. This case is an exceptionally good

piece of construction and very rigid. The lower half of the crankcase is of cast iron, heavily webbed, especially the support of the center crankshaft bearing, which is a cross hollow section across the case supporting the center bearing. This section alone is strong enough to support all three crankshaft bearings. In the lower half of the case there is cast integral a sump base to carry 5 gal. of oil. There is also located in the oil sump an exhaust heater down which the exhaust passes and through the oil, heating it up for winter usage. This exhaust can be used as an oil radiator in summer by letting cool air pass through it, absorbing the heat from oil which surrounds it. The oil filler is also at the lower half of the crankcase, having a $2\frac{1}{2}$ -in. opening.

Crankshaft and Bearings

Crankshaft drop forged, machine finished all over. Forged integral with the crankshaft is a flange for supporting the flywheel, and a continuation of the crankshaft, which allows a pilot bearing for the clutch. The cheeks next to the crankshaft bearings are $1\frac{3}{16}$ in. x $3\frac{15}{16}$ in. The cheeks between the rod bearings are $1\frac{3}{4}$ x $2\frac{9}{16}$ in., cheeks being drilled to by-pass oil from the main crankshaft bearings to the connecting rods.

The bearings are babbitt lined, steel back. The bearings are $2\frac{1}{8}$ in. x $3\frac{3}{4}$ in. and interchangeable, being held in lower half of case by heavy cast-iron caps and $\frac{4}{8}$ -in. studs. No shims under caps. Two ball thrust bearings are used.

Connecting Rods and Bearings

Drop forged, I-beam section, semi-finished, the caps being held on by four $\frac{1}{2}$ -in. bolts; drilled on each side of the rod are $\frac{1}{4}$ -in. holes for oil collector pockets.

The bearings are babbitt lined, bronze backed, with X type oil grooves in lower and upper half. They are 2 in. in diameter x $3\frac{3}{8}$ in. long, being held in place by dowels and no shims being used. Wristpin bearings are bronze bushings pressed into the rod with $\frac{1}{4}$ -in. holes drilled on top rod for an oil collector for lubrication of the wristpin.

Pistons and Pins

Pistons are dome type with four $\frac{5}{16}$ -in. lap joint, hammered, concentric compression rings. Piston is $5\frac{1}{2}$ in.

long with a plain skirt, no oil grooves, milled out at each end of wristpins. At the bottom of the piston is a heavy rib; the walls of the skirt are $\frac{1}{8}$ in. thick. The wristpin is $1 \frac{3}{16}$ in. in diameter and located $2 \frac{11}{16}$ in. from the top of the piston. The wristpin is held in place by set-screw and cotter key.

Timing Gears

The timing gears are spur type and hardened. The magneto drive shaft is carried on two ball bearings. The crankshaft timing gear is $3 \frac{7}{16}$ in. outside diameter, 37 teeth, $\frac{3}{16}$ in. deep, $\frac{1}{8}$ in. thickness at base and $\frac{3}{4}$ in. face. The idle gear hub is $3 \frac{1}{4}$ in. long, bronze bushed, and runs on a shaft, supported at each end. The camshaft is a sliding shaft with small cams on exhaust cams for compression release. A forked bell crank fits into a recess curve in the hub of the camshaft gear. The bell crank is operated from the front of the motor.

Camshaft and Bearings

Camshaft is a drop forging with cams forged integral. Shaft is hardened all over, with three bearings. The base circle is $1 \frac{9}{16}$ in. in diameter, $1 \frac{3}{16}$ in. face and $\frac{7}{16}$ in. lift; opposite the exhaust cams there are small auxiliary cams for compression release.

The center camshaft bearing is a cast bronzed spider type, split. The two end bearings are cast iron, not split.

Valves

Valves are mushroom type, $2 \frac{3}{8}$ in. diameter, $\frac{1}{4}$ in. thick head, 45 deg. seat, $\frac{1}{8}$ in. wide, 8 in. long, with a $\frac{7}{16}$ -in. diameter stem. Intake and exhaust are interchangeable. Valve springs are cone shaped, held on by heavy machine cap, cap being held on by $\frac{1}{8}$ -in. x $\frac{5}{16}$ -in. straight pin. Valve caps are of cast iron with deep pockets. The spark plugs are located in these caps. Valves are not protected from dust.

Valve Tappets and Guides

Valve tappets are of the roller type with a $1 \frac{1}{8}$ -in. body. The adjustment is by adjusting tappet and jam nut. Instead of the adjusting tappet working directly over the center it is offset to the outside radius. The purpose of this is that when the cam hits the face of the roller on the opposite side of the center of the tappet it has a tendency to force the tappet body in the direction of the rotation of the cam. The instant the cam comes in contact with the roller, the adjusting end of the tappet comes in contact with the valve spring, counteracting this rotary force and thus causing the tappet guides to wear round instead of oblong.

Governor

Governor is located on the magneto drive shaft inside of the timing gear case. It is a spring and fly ball type, with the motion taken from it by a sliding collar on the shaft, a forked arm and bell crank leading to the governor valve. It is very small and compact with only eight pieces in the complete assembly.

Oiling System

Oiling system is a forced feed to the crankshaft bearings, by-passed through drilled cheeks and pins to the connecting rods. The oil pump is a gear pump, driven by a shaft and worm and spiral gear from the camshaft. This gear is integral with the camshaft. Pump is located in the lower half of crankcase and forces the oil through copper tubing to the crankshaft bearings, underneath the shaft instead of overhead. Balance of motor lubricated by

oil vapor. Oil is heated by exhaust heater, running through lower half of case. Divert the exhaust and the heater can be used as a cooling system.

Water System

Water system is a 4-in. centrifugal pump, bronzed impeller and cast iron housing, with a 1-in. water intake through the center and discharged overhead. Pump is located on side of crankcase and held by a trunnion bearing, and is driven by a gear and shaft, and is held onto the upper half of crankcase by cast integral bracket.

Ignition

Ignition system is a single system high tension type Z. U. 4 Bosch magneto. A continuation of armature shaft allows for inertia type governor. This governor is used to advance the armature in the field instead of the customary practice of advancing breaker box. For checking up secondary rotor a celluloid window is located opposite contact No. 1 in secondary distributor cover. Magneto is located on the right-hand side of the motor and is driven by a gear attached to the end of the armature shaft, meshing directly into the camshaft gear.

Carbureter

Carbureter is a $1 \frac{1}{2}$ -in. vertical Zenith. The construction of this carbureter is identical with the American practice Zenith.

Fan

Fan is 20 in. in diameter, four blades, material sheet steel riveted to a steel hub, having machined fan pulley on end. The fan shaft rides on a single row bearing with an adjustment on rear end of hub and is bolted to a steel casting, which is mounted on the top of cylinder. The fan shaft is of a crank type, having an extending arm with a ball cap on end. The fan bracket is also cast with a ball end; mounted between these two ends there is a steel retainer with shaft and spring. A dog cast on side of fan bracket keeps the fan shaft from moving. It also keeps the fan belt tight and takes care of the adjustment between fan pulley and driving pulley on crankshaft.

Weights

Connecting rod and piston complete, 15 lb. 4 oz.
Valve tappet assembly, 1 lb. 5 oz.
Valve, 11 oz.
Valve spring, 6 oz.

Remarks

This motor is a bad service job, by reason of its being suspended from the lower half of the crankcase, with the crankshaft bearings also in the lower half. Before the connecting rod bearings or crankshaft bearings can be adjusted, it is necessary completely to disassemble the motor. When the upper half of the case is removed the timing is affected. The upper and lower half of the crankcase joints are lapped joints, no gaskets. The connecting rods are large enough for a motor $1 \frac{1}{2}$ in. larger in bore than this one. Practically everything is of cast iron—cylinders, upper and lower half of crankcases, exhaust and intake manifolds, timing gear case, water pump body, valve caps, fan bracket and a number of other miscellaneous parts. There are no highly finished parts nor traces of finished workmanship. All the parts appear to have been individually made. The starting crank is located in a large cast-iron bracket, bolted onto the lower crankcase. Manifold and valve plug gaskets are asbestos reinforced with sheet zinc.

Variation of Airplane Engine Speed with Speed of Flight

This is a technical discussion of a factor in airplane practice that is known to all pilots, but which has not previously been studied to the extent that Mr. Warner has gone into it. There are several factors entering into this study, which have been established in practice but not in theory

By Edward P. Warner

ALTHOUGH it is well known by all pilots and others who deal with the practical side of aviation that the engine speed with full throttle varies considerably as the plane speed varies, due to the changing conditions of propeller operation, and that the r.p.m. are much lower, for example, when the machine is held stationary on the ground while warming up the engine than when it is flying level at its maximum speed, there are very few quantitative data available on this important point. Owing to the rapidly changing and little-known indraught conditions at speeds remote from that at which the propeller was designed normally to work, it is not easy to compute the r.p.m. which the propeller must make in order to absorb a given amount of work, and it is necessary to depend on experiments on complete propellers.

If a curve of torque coefficient,

$$Q_c = \frac{Q}{V^2 D^5}$$

is plotted among the characteristics of the propeller, it is easy to determine the r.p.m. for a series of values of V , making the usual assumption of constant torque furnished by the power plant.

Since

$$Q_c \times \left(\frac{V}{ND} \right) = \frac{Q}{N^2 D^5}$$

and Q and D are both constants,

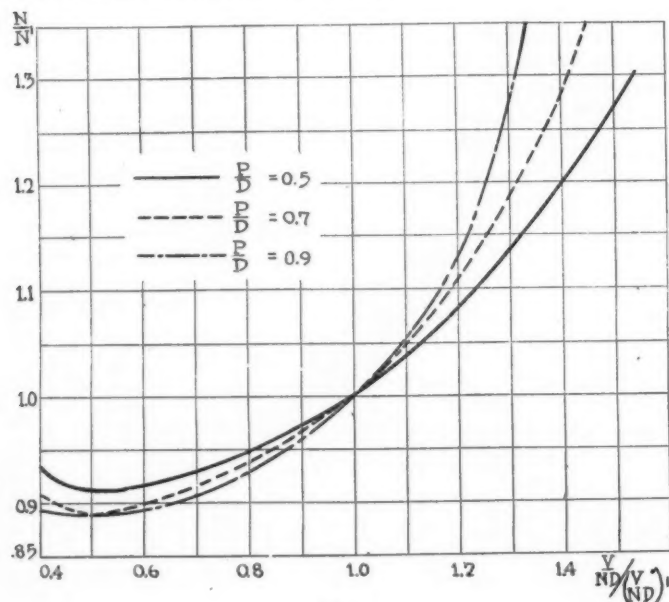


Fig. 1

$$N = \frac{C}{\left(\frac{V}{ND} \right) \sqrt{Q_c}}$$

the value of C can be determined from a knowledge of the engine torque (or power at any speed) and the propeller diameter. Having found N from the above equation, and

knowing $\frac{V}{ND}$, V can be computed, and N may be plotted against V or $\frac{V}{ND}$.

The variation of N (propeller revolutions) has been computed in this way for a number of propellers tested by Dr. Durand at the Leland Stanford wind tunnel.* The propellers were arranged in three groups, according to pitch, and the average variation of N for each group is plotted in Fig. 1. Other alterations than those of pitch (blade form, camber, etc.) had very little effect on N .

The curves in Fig. 1 are plotted with the ratio $\frac{N}{N'}$, where

N' is the r.p.m. when the efficiency is a maximum, as ordinates, and the ratio $\frac{V/ND}{(V/ND)'}$, where $(V/ND)'$ is the slip

function corresponding to maximum efficiency, as abscissae. With such co-ordinates, the results shown by the curves can readily be applied to any other propeller of roughly similar type. In estimating the variations of r.p.m. for a power plant, they may be assumed to follow one of these three curves, the choice among the three depending on the pitch-diameter ratio of the propeller to be employed.

Since D is always the same,

$$\frac{V/ND}{(V/ND)'} = \frac{V}{V'} \times \frac{N'}{N}$$

The product of the ordinate and abscissa of any point is then

$$\frac{V}{V'} \times \frac{N'}{N} \times \frac{N}{N'} = \frac{V}{V'}$$

This equation, separating N and V , makes it possible to determine $\frac{N}{N'}$ directly in terms of $\frac{V}{V'}$.

*Third Annual Report, National Advisory Committee for Aeronautics, Washington, 1918.

A Numerical Example

The method of using these curves can be best illustrated by an example.

Suppose a propeller is designed for an airplane flying normally at 100 m.p.h. and that the full engine power is absorbed by the propeller at 1,600 r.p.m. The middle curve, drawn for propellers having a pitch-diameter ratio of 0.7, will be used. If the speed of the machine increases

so that $\frac{V}{ND}$ becomes equal to 1.1, $\frac{N}{N'}$ is 1.052. $\frac{V}{V'}$ is

then the product of these two figures, or 1.157. Therefore, since V' is 100 and N' 1,600, it appears that the propeller will turn 1683 r.p.m. on full throttle at 115.7 m.p.h. As many other points as are desired may be obtained in the same way, and a curve of r.p.m. against speed of flight drawn for any particular propeller and engine. This has been done in Fig. 2, where $\frac{N}{N'}$ is plotted against $\frac{V}{V'}$.

It will be noted that the variation in N is much greater with high-pitch than with low-pitch propellers. This might be predicted from the blade-element theory of design, as the change in effective angle of incidence of a blade element with a given alteration of V/ND is greatest when the angle of blade setting is large and so when the pitch is high. This variation of N in high-pitch propellers is a disadvantage which counterbalances, at least in part, the advantage of raising the peak of the efficiency curve—an advantage which a high-pitch propeller, in conjunction with a geared-down power plant, possesses.

Minimum Value of Revolutions Ratio

A very interesting point in connection with the curves of Fig. 1 is the occurrence of a minimum value of $\frac{N}{N'}$. This occurs, for all pitches, when the ratio of V/ND to $(V/ND)'$ is very close to one-half. If, instead of considering the torque to remain constant while the r.p.m. and speed of flight vary, the r.p.m. be assumed to remain constant while the torque varies, the existence of this minimum in the curve indicates that there is a point beyond which further reduction of the speed of flight will decrease the torque with constant r.p.m. Although this is not obvious from the form of the expression for torque on an element, a detailed analysis will show that it is in accord with the blade-element theory (see Mathematical Appendix).

The minimum value of $\frac{N}{N'}$ is not very low, and the r.p.m. will seldom drop more than 10 per cent below the normal value at maximum propeller efficiency. The variations of N in the other direction are much more rapid, and an increase of 30 per cent or 40 per cent in the value of the slip function will allow the engine to race up to an extremely high number of revolutions.

A Common Error

In drawing the "horsepower available" curve for performance calculations, it is common practice to take the horsepower available at any particular point as equal to the product of the rated engine horsepower by the propeller efficiency at the value of V/ND corresponding to the point in question. Variations in engine speed are thus entirely ignored, and the assumption that the propeller torque depends only on r.p.m. and not at all on speed of advance is tacitly made.

It is quite easy, however, to eliminate the error due to this assumption, so long as the engine torque can be considered constant. When it is necessary to deal with an

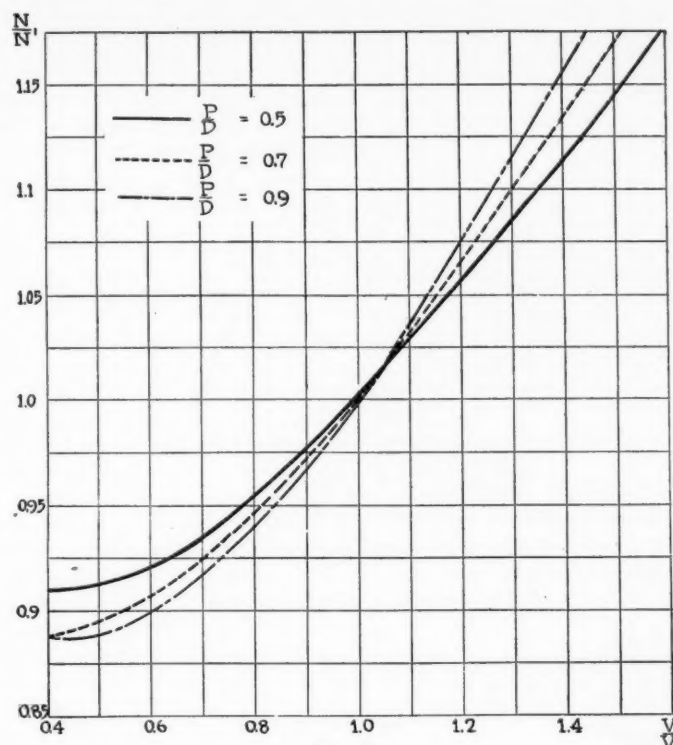


Fig. 2

experimentally-determined horsepower curve, the matter becomes more complex. We have already seen how N can be computed for any value of V with constant torque. Since power is the product of torque by revolutions per unit time, the horsepower available will be equal to the rated horsepower at N' revolutions per minute, multiplied by $\frac{N}{N'}$. It has already been shown that the value of $\frac{V}{V'}$, when engine speed variation is allowed for, is equal to the value of $\frac{V}{V'}$ for constant engine speed (as in the simple propeller efficiency curve already mentioned) multiplied by $\frac{N}{N'}$.

In going from the original curve (propeller efficiency times rated horsepower) to the new and more accurate one, the abscissa and ordinate of each point are therefore multiplied by the same quantity (N/N'), although the values of this multiplier are different for different points. A line drawn through any pair of corresponding points on the two curves will therefore pass through the origin of the chart. In Fig. 3, curve No. 1 is the curve of propeller efficiency against speed of flight, engine speed remaining constant. No. 2 is the curve of "apparent efficiency," the ratio of horsepower available to rated engine horsepower, at normal speed, torque being constant, and was obtained in the manner just described. The propeller to which these curves relate had a pitch-diameter ratio of 0.7. The curves show that variation of r.p.m. with constant torque has the effect of shifting the peak of the horsepower available curve a considerable distance to the right on the diagram. Its effect over the more important part of the field, the portion in the immediate neighborhood of and to the left of the maximum propeller efficiency, while by no means negligible, is much smaller, never amounting to more than 5 per cent.

Racing of Engine at High Plane Speed

This method is very satisfactory for speeds below that of maximum propeller efficiency. As the speed increases,

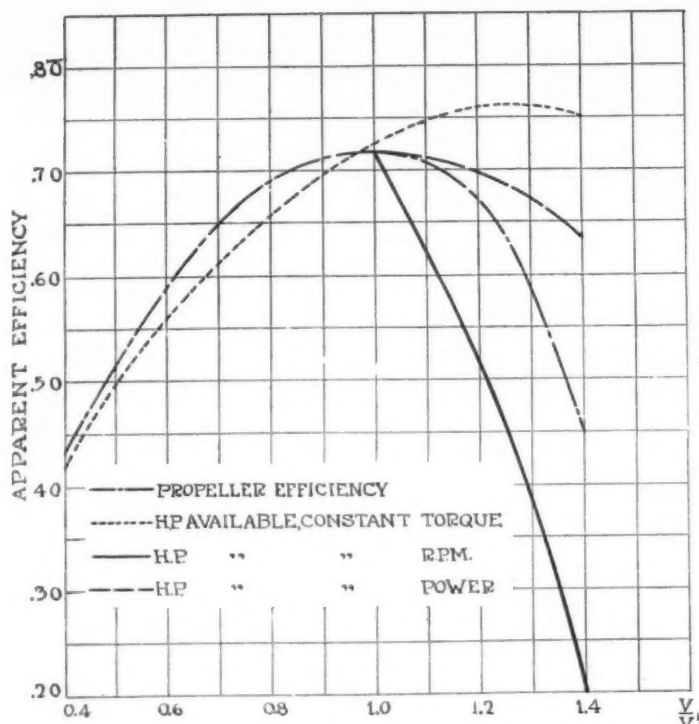


Fig. 3

however, the engine will tend to race if the throttle remains wide open. This cannot be permitted beyond a certain point, as it is injurious to the engine and as there would be danger of bursting the propeller if the normal peripheral speed were close to the limit of safety. Propellers have been known to break from this cause on going into a steep dive with the throttle kept open. Furthermore, the assumption of constant torque would not be correct at speeds very much in excess of the rated r.p.m., as the increasing internal friction and decreasing volumetric efficiency cause a rapid falling off of torque.

There are two other assumptions, either of which can be used at high speeds of flight in place of that of constant torque. Either power developed or r.p.m. may be taken as remaining fixed. If N be considered constant, the value of $\frac{V}{V'}$ for a given $\frac{V}{ND}$ is the same as in curve No. 1. The power developed, however, and consequently

the power available also, is reduced in the ratio $\frac{1}{\left(\frac{N}{N'}\right)^2}$

torque being proportional to N^2 . The horsepower available under this condition is shown by curve No. 3, and is very much lower than that given by No. 1.

If the horsepower delivered is kept equal to the rated horsepower when the r.p.m. equal N' , and if we let N_2 be the r.p.m. under these conditions, we have, since horsepower with a given slip ratio is proportional to N^3 :

$$\frac{P_2}{P} = 1 = \frac{N}{N'} \times \left(\frac{N_2}{N'}\right)^2$$

Then

$$N_2^3 = N'N^2 \quad \frac{N_2}{N'} = \left(\frac{N}{N'}\right)^{\frac{2}{3}}$$

In this case, therefore, the transference of points from curve No. 1 is effected by multiplying the abscissae by $\left(\frac{N}{N'}\right)^{\frac{2}{3}}$, while keeping the original values of the ordi-

nates (since, by definition, the horsepower delivered to the propeller is unchanged).

The true condition probably lies somewhere between (3) and (4) in most cases. It is evident, if this be true, that the performance at high speeds will be fairly close to that predicted with no account taken of engine speed variation. The horsepower available at speeds below the peak of the propeller efficiency curve, on the other hand, will be inferior to the product of rated power and propeller efficiency. The net result usually is to make a propeller designed especially for the best climb perform a little more poorly at high speeds, and a "high-speed propeller" somewhat more poorly at low speeds, than their efficiency curves would indicate, although the "climbing propeller" would show a marked improvement at high speeds, as compared with the deductions from its uncorrected efficiency curve, if the throttle were to be kept wide open and the engine allowed to race. It is evident that, for accurate performance computation, the efficiency curve must be modified, in securing the horsepower available, to allow for these effects.

Mathematical Appendix

LOCATION OF MAXIMUM TORQUE WITH N FIXED AND V VARIABLE

The torque on a blade element is given by the expression

$$Q = b \cdot V_r^2 \cdot \Delta l (K_x \cos \alpha + K_y \sin \alpha) \cdot r$$

where b is the width of the element, V_r the resultant velocity, Δl the length of the element, and r the distance out from the propeller axis, K_x and K_y the drag and lift coefficients of the propeller section at its angle of attack, and

$$\alpha = \tan^{-1} \frac{V}{2\pi r N}$$

V being the speed of the airplane and N the revolutions in unit time.

Differentiating Q with respect to V , we have:

$$\frac{dQ}{dV} = \frac{dQ}{d\alpha} \cdot \frac{d\alpha}{dV}$$

$$\frac{d\alpha}{dV} = \frac{2\pi r N}{(2\pi r N)^2 + V^2}$$

Since $\frac{d\alpha}{dV}$ never vanishes while the propeller is rotating,

$\frac{dQ}{d\alpha}$ must be zero in order that there may be a maximum value of torque.

$$\begin{aligned} \frac{dQ}{d\alpha} &= b \cdot \Delta l \cdot r \left[2 V_r \frac{dV_r}{d\alpha} (K_x \cos \alpha + K_y \sin \alpha) \right. \\ &\quad \left. + V_r^2 (K_y \cos \alpha - K_x \sin \alpha + \frac{dK_x}{d\alpha} \cos \alpha + \frac{dK_y}{d\alpha} \sin \alpha) \right] \\ V_r &= 2\pi r N \sec \alpha \end{aligned}$$

Therefore, when $\frac{dQ}{d\alpha} = 0$,

$$\begin{aligned} 2 \tan \alpha (K_x \cos \alpha + K_y \sin \alpha) + K_y \cos \alpha - K_x \sin \alpha \\ + \frac{dK_y}{d\alpha} \sin \alpha + \frac{dK_x}{d\alpha} \cos \alpha = 0 \end{aligned}$$

$$K_x \sin \alpha + K_y \sec \alpha = - \left(\frac{dK_x}{d\alpha} \cos \alpha + \frac{dK_y}{d\alpha} \sin \alpha \right)$$

Since $(\alpha + \beta)$, where β is the angle of incidence at which

the blade meets the air, is a constant for any blade element,

$$-\frac{dK}{d\alpha} = \frac{dK}{d\beta}$$

the slope of the curve of lift or drag coefficient against angle of incidence. The condition for maximum torque is then:

$$K_x \sin \alpha + K_y \sec \alpha = \frac{dK_x}{d\beta} \cos \alpha + \frac{dK_y}{d\beta} \sin \alpha$$

This equation can be solved by trial for any particular conditions. The solution has been carried through for

several cases, and it was found, in every instance, that the equation was satisfied when α was very nearly equal to β . In most cases, α was a little smaller than β . When due allowance is made for the effect of indraught, this checks very well with the location of the maximum torque found from Dr. Durand's experimental data.

THE Bureau of Navigation reports that 143 sailing, steam, and unriggered vessels of 347,051 gross tons were built in the United States and officially numbered during November.

New Axle Introduced

IT is planned to introduce a modified form of the Torbensen internal-gear-drive truck axle, to be known as the type B axle. Instead of taper roller bearings for the pinion shaft, ball bearings will be made use of, and several other changes from preceding designs will be made. A "Powerlock" differential is used, which is designed to give a positive pull to both wheels at all times, but to provide a differential action when required.

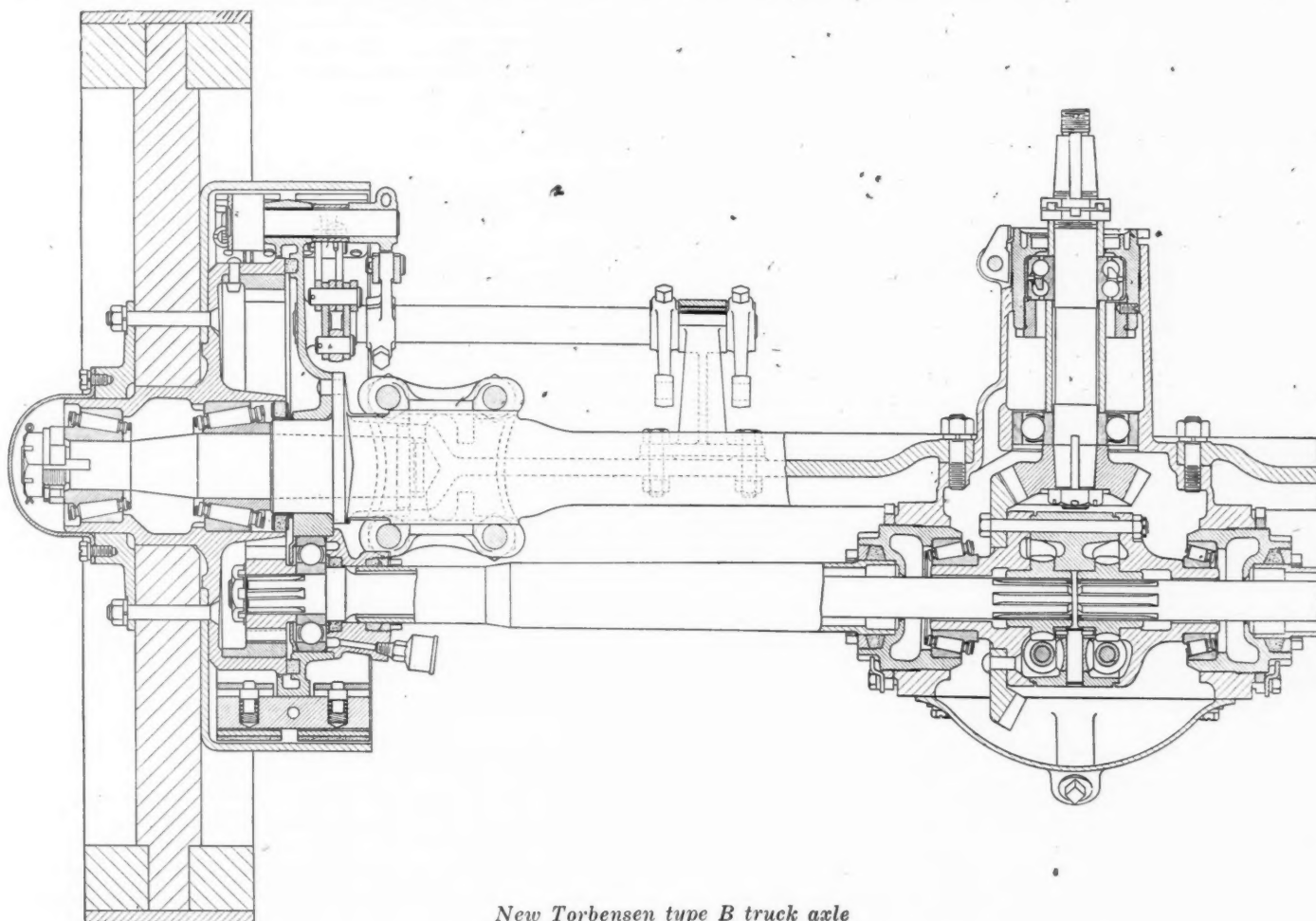
The helical type of bevel gear is used, the object being to reduce noise and provide smooth running. The internal gear is pressed solidly into place to guard against the possibility of looseness. The internal gear felt is held firmly in place in such a manner as to insure a continuous oil channel.

Replacing the former two-piece differential carrier is a one-piece type of carrier. Differential bearings are carried in cages and are solidly locked after adjustment. Suitable felt adjusters are used on the jack shaft cover to

eliminate oil leakage. An oil filler back of the differential carrier insures the easy filling of the housing.

The model B axle is designed particularly for 1½-ton trucks and an option is given on three reduction ratios, 7.6:1 (standard), 8.5:1 and 6.1:1. The limiting capacity is 27 hp. at 1000 r.p.m. The maximum load on spring pads is 5400 lb. Springs have a maximum width of 3 in. and centers 37-39½.

ACCORDING to Dr. F. B. Silsbee, the cracking of the rubber insulation on the high-tension cables connecting the spark plugs of gasoline motors to the distributor is due to ozone. The ozone produced by electrical discharges in the neighborhood of such cables attacks unstressed rubber uniformly and very slowly. The presence of a very little mechanical tension in the insulation, however, is sufficient to localize the corrosion into a few deep cracks, which rapidly extend to the core of the cable and render it useless.



New Torbensen type B truck axle

Unprecedented Number of Items Before Standards Committee

A good deal of work at the New York meeting was for extensions and revisions. Interesting discussions in consideration of connecting rod bolt proposal, glare limit, standard for lamps, shaft fittings and roller chains. Trailer tires and hitches considered

By P. M. He'dt

AN unprecedented number of items were dealt with at the meeting of the Standards Committee of the S. A. E. at the New York meeting January 6. Many of these, however, were in the nature of extensions of old standards, or revisions of same. Some of the standards adopted were printed in the January 15th issue; the rest appear at the end of this article.

The first report was that of the Ball and Roller Bearings Division and was presented by F. C. Goldsmith. According to this report, trouble was experienced, particularly in aeronautic work, owing to the rounding of the edges of the outer rings not being a true quarter circle. The Division therefore recommended that all corner radii for ball and roller bearings be specified as minimum radii. In the report of the committee it was recommended that this addition be made to all present standards for ball and roller bearings, but upon motion it was decided to make this read "all present and future standards." Tolerances were recommended for the separable or open type of annular ball bearings accepted by the Society in April, 1919. These two recommendations were adopted.

A recommendation for an extra light series of annular ball bearings was referred back to the Division. The objection was raised that this series is not yet in use here, and as the practicability of the design was questioned, it was thought best not to put it on the standards lists at the present time. Two extra wide series of annular ball bearings were adopted, one light and one medium.

The Electrical Equipment Division recommended that the present S. A. E. standard for bracket mountings for generators be revised so that the thread for the shaft end will be 7/16 in.-20 S. A. E. instead of 7/16 in.-14 U. S. S., and that the present S. A. E. standard for flange mountings for generators be revised to specify the shaft end as 1/2 in.-20 S. A. E. instead of merely 1/2 in. Both recommendations were adopted.

Engine Supporting Arms

The Engine Division made a report concerning engine supporting arms, adding one width specially suited to truck and tractor engines, to the previous standard widths. This new width allows for 20 in. between supporting rails, which dimension is extensively used at present. The new supporting arms, No. 2 T, are to be used on flywheel housing No. 2. This recommendation was adopted.

When the tractor engine and transmission are used as a self supporting unit, it is often desired to use larger cap screws than those given in the present standard.

The Engine Division, therefore, recommended that the following note be added to the present standard: When it is desired to use 1/2 in.-13 in place of 3/8 in.-16, U. S. Standard cap screws, they shall be located on the standard bolt circle, the flange inside diameter remaining the same, while the outside diameter of the transmission case flange may be increased by 1/2 in. When the outside diameter of the transmission case flange is not finished (as when channel iron supporting pads or brackets are cast over the edge of the flange) the outside diameter of the transmission case flange is increased 1/2 in. over the outside diameter of the standard finished flange. The inside diameter and the bolt circle are to be the same in either case. This recommendation was adopted.

The Engine Division also recommended the insertion in the present S. A. E. Standard for engine testing forms of a statement that they are for use with either gasoline or kerosene fuel. The recommendation was adopted.

Connecting Rod Bolts

Another recommendation made by the Engine Division was for a standard connecting rod bolt, this matter having been taken up at the suggestion of a bolt manufacturer. This bolt has a flat, tapered head, which is cut away on one side, and three sizes of bolts were recommended. Mr. Bachman thought that the range of sizes was not sufficient. A fillet radius of 0.01 in. was shown at the junction of the stem and the head, and this led to some comments. Mr. Ehrman held that this fillet radius need not be inspected, but others maintained that it was fully as important to check this radius as to check the stem diameter. Mr. Crane suggested that the head thickness, which was the same for all three sizes of bolts, should increase with the stem diameter, and suggested the formula $t = \text{diam.} \div 2 + 1/32$ in. for the head thickness. It was finally decided to return this recommendation to the committee, with the suggestion that the range of sizes be increased, that the thickness of the head should be made to vary with the size of the stem, and that further attention should be given to the matter of the corner radius.

Crankpin Grinding Wheels

Data gathered by the Engine Division showed that 64 companies in the passenger car, commercial vehicle and tractor industries, used 29 widths of crankpins, and 7 different sizes of radii. It was felt that the adoption of a standard for grinding wheel widths for crankshafts would enable manufacturers of abrasive wheels to ma-

terially reduce the number of stock wheel sizes, and permit quicker deliveries than when wheels are made to purchaser's specifications. It was also hoped that the proposed standard would indicate the proper method of specifying wheel widths, as at present there was considerable misunderstanding regarding the extra width allowed on new wheels for dressing purposes. The nominal widths recommended were $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, $1\frac{7}{8}$, 2 in., $2\frac{1}{8}$, $2\frac{1}{4}$, $2\frac{3}{8}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{4}$, $3\frac{1}{2}$, $3\frac{3}{4}$ and 4 in., and the radius at the edges recommended was $\frac{3}{32}$ in. maximum. Grinding wheel manufacturers allow 0.029 in. additional for truing the wheel.

There was considerable discussion on this report. Mr. Turner of the Norton Co. considered the gradations of sizes too fine, and wanted all $\frac{1}{8}$ in. sizes eliminated, which would have given 12 instead of 16 different sizes. He also suggested that the $\frac{3}{32}$ in. radius specified should be the minimum instead of the maximum, for the reason that if the corner radius was made too small the wheel would break down in use at the edge. In reply to these objections it was explained that the corner radius specified for the wheels was not intended as the crankpin fillet radius, but the wheels should be delivered with a comparatively small radius so that the manufacturer could dress the wheel up to any desired radius. The recommendation was adopted.

New Steel Specifications

The Iron and Steel Divisions recommended for adoption a new specification for low tungsten steel, referred to as Specification No. 7260. This steel is widely used for both inlet and exhaust valves. The analysis given conforms to specification No. W-60b of the Bureau of Aircraft Production. A nominal 5 per cent nickel steel, which is widely used for case hardened parts, was recommended for adoption as the S. A. E. Standard Specification No. 2512. The report also contained a recommendation regarding a malleable iron casting standard, which corresponded to A. S. T. M. Specification 827-19. In connection with the discussion of this recommendation, the question was raised whether the S. A. E. should concern itself with the testing of materials, a field that is efficiently covered by the American Society for the Testing of Materials. Mr. Crane thought that the malleable iron specification should be adopted as a matter of general information, for publication in the Handbook of the Society only. It was brought out in the discussion that where malleable iron castings are concerned, the chemical composition is no reliable guide to mechanical qualities, and mechanical tests are absolutely necessary. Mr. Crane moved that the malleable iron specifications be adopted as recommended practice, but this motion was lost, and after further extended discussion, in which the undesirability of having more than one standard specification for any class of material was pointed out, the recommendation of the Iron and Steel Division to adopt the malleable iron specification as an S. A. E. Standard was adopted.

Another item in the report of the Iron and Steel Division concerned high chromium steel. Chemical and physical specifications were given, as well as directions for the heat treatment of this steel, but it was not proposed to adopt the specifications as an S. A. E. Standard for the reason that the composition is covered by patents. The plan is to print the material in the Handbook of the Society as useful information.

High chromium, or, as it is sometimes called, stainless steel, contains from 11 to 14 per cent of chromium and was originally developed for cutlery purposes, but has in the past few years been used to a considerable

extent for exhaust valves in airplane engines, because of its resistance to oxidation or scaling at high temperatures.

Lighting Division Report

A series of standard sizes for side glasses was recommended by the Lighting Division, one of these sizes of 3 in. nominal diameter being identical with the present standard tail lamp glass, except for the tolerance specified. The sizes recommended range from 2 to 7 in. in diameter. The thickness of the bezel for all sizes is $\frac{1}{8}$ in., plus $\frac{1}{32}$, minus 0. This is commonly known as double thick American glass. It was recommended that this standard should become fully operative July 1, 1921. On the present standard tail lamp glass, the tolerances are plus $\frac{1}{32}$, minus $\frac{1}{64}$ in., but it was recommended to change these to conform with the new standard for side lamp glasses. The recommendation was adopted.

Glare Limit Standard

The Lighting Division also recommended a revision in the present standard of head-lamp illumination, which latter specifies that no portion of the direct reflected cone of light shall rise above 42 in. As the direct reflected cone of light cannot always be satisfactorily defined and as a certain amount of light should be permitted above 42 in., the Division believes that the actual glare and illuminating candle power values which should obtain at certain parts of a screen when placed 100 ft. in front, and at right angles to the axis of the head-lamp, should be specified. Measurements of the illumination produced can be made easily and accurately by means of a portable foot-candle meter, and it is therefore very simple to determine whether or not the headlamps are properly adjusted to comply with any requirements.

The report was presented by W. A. McKay and a history of the development which led to the formulation of the proposed standard was given by Dr. Sharp of the N. Y. Electrical Testing Laboratories. It was pointed out that one reason for the suggestion to cancel the former S. A. E. standard for headlamp illumination was that legislation had superseded this standard, and at the present time the States of New York, New Jersey, Connecticut, Pennsylvania and California, had on their statute books laws which limit the glare to 800 candlepower, the limit set in the new standard. Wm. S. Harley pointed out that in the consideration of the illuminating problem, not sufficient attention was given to the requirements and limitations of motorcycles. Motorcycles carried only a single headlamp, and could not produce the intensity of illumination called for in some of the laws. The recommendation of the committee was adopted, with instructions to the Division that it pay particular attention in the future to motorcycle requirements.

Shaft Fittings

The Shaft Fittings Division recommended that the present standard for taper fittings with plain nuts be withdrawn. It was pointed out in the report that this form of fitting had been discontinued in practice in favor of the use of castle nuts, which was better engineering practice. The present standard for taper fittings with plain nuts corresponds to the present standard for taper fittings with castle nuts, except for the form of nut. This report was presented by E. W. Spicer, who is Chairman of the Division. Opposition to the recommendation developed immediately. It was stated that a cotter pin was not the best type of locking de-

vice for use with a nut securing a taper fitting, for the reason that if a workman takes a taper fitting apart and reassembles it, it sometimes happens that he cannot get the nut quite up to a certain slot, and will then turn it back and put the cotter pin into the next slot. This results in a loose fitting, which is very objectionable. Mr. Crane agreed with Mr. Bachman, who had pointed out this defect of the castle nut, that the cotter pin was useless for taper fittings. Mr. Ehrman wanted to know why the nut shown in the illustration was referred to as a castle nut; it was known as a slotted nut in the trade.

It was brought out that the small diameter of the hexagonal nut specified for this taper fitting did not correspond in all sizes to the S. A. E. Standard nuts, and that therefore the same wrenches could not be used. The proposal to withdraw the present standard for taper fittings with plain nut was rejected and the proposal for taper fittings with castle nuts was referred back to the Division. Recommendations were made for a revision of the four-spline, six-spline and ten-spline fittings, the chief modifications being an increase in the tolerances on the bore of these fittings, and in addition a new 16-spline fitting was recommended for use on large work. This latter insures greater shaft strength, owing to the small height of the splines, than either a 10- or 12-spline fitting. All proposed spline fitting standards were adopted.

Marine Division Report

After luncheon the report of the Marine Division was taken up, which was presented by H. H. Brautigam. It was felt that standardization of the direction of movement of motor boat control levers would simplify the handling of motor boats, and minimize accidents caused by unfamiliarity with controls, and the Division therefore proposed a standard form of control. With spark and throttle control levers for boats intended for one man control, the spark lever should be shorter than the throttle lever, and both should be mounted on stationary sectors. The sector should be placed so that the levers are moved forward or upward to advance the spark, or to open the throttle. The gearshift lever should be placed so that it is moved forward to pass from neutral to ahead, and backward to pass from neutral to reverse. The recommendation was adopted.

The Division recommended that the present S. A. E. Standard for two and four bolt type carbureter flanges be made S. A. E. recommended practice for marine water pipe flanges. Adopted.

The S. A. E. Standard for steel reverse couplings had been criticized because the nut specified did not conform to the S. A. E. Standard, causing unnecessary expense and trouble in obtaining special nuts. The Division therefore proposed that the standard be revised so as to allow the use of S. A. E. Standard nuts, and a drawing and table in accordance with recommendations were given. The recommendation was adopted.

Ball and Socket Control Joints

The Miscellaneous Division recommended for adoption as S. A. E. Standard a series of ball and socket joints for control connections. The proposed standard applied to two most widely used types of ball and socket joints, and it was stated that the series of sizes given met all general requirements for spark and throttle control. Adopted.

Under the heading of brake shaft bushings, a table was given of inside diameters, lengths, wall thicknesses and tolerances on inside diameters. It was explained that this was suggested by a manufacturer of oilless

bearings, and a better name for the bushings would be oilless bushings, because they are used also for other purposes than brake shafts. Adopted.

Standard Radiator Caps

A further recommendation of the committee was for four sizes of standard tank and radiator caps. A counter bore of three threads was specified for the cap in order to allow sufficient clearance for tapping. This proposal was based on the recommendation made at the June, 1919, meeting of the Standards Committee, when it was referred back to the Division for further consideration. It was the consensus that the S. A. E. Standard fine thread should be specified, rather than the U. S. Standard pitch, and that the $\frac{1}{8}$ -in. sizes should be eliminated. The report was adopted.

Vacuum Tank Mounting

At the midsummer meeting of the society, the subject of fuel vacuum tank mounting and connections was proposed for standardization. It was stated at that time that the vacuum method of regulating the flow of gasoline into the carbureter had been adopted for use in approximately 80 per cent of all makes of automobiles, but that there was no uniform practice for the mounting dimensions or connections for the fuel and vacuum pipe lines. The recommendation made was in the form of a drawing, showing a round tank and a D type tank. The pipe line connections for the vacuum pipe and gasoline outlets are specified as Briggs Standard tapered thread, which conforms to S. A. E. recommended practice for carbureter fittings. Adopted.

Only a brief report was made by the Motorcycle Division. This related to a revision of the spark plug shell. In the new specifications the limits for the spark plug threads are given to four decimal points instead of three, and these limits are said to be more closely in accordance with good motorcycle engineering practice. It is pointed out, however, that this specification, together with all other S. A. E. approved thread standards, will probably be more or less affected by the final report of the National Screw Thread Commission. Adopted.

Aluminum Alloy Specifications Revised

Three aluminum alloy specifications were proposed in the report of the Non-Ferrous Metal Division. These are known, respectively, as Nos. 30, 31 and 32. The previous aluminum alloy standards of the S. A. E. were adopted in 1911, and the new specifications take care of advances made in aluminum alloy since that date. Specifications 30 and 31 are only slightly modified from the previous specifications, while specification 32 is an entirely new alloy. It was brought out in the discussion that the new alloys are based chiefly on sand casting practice and do not cover die casting practice. The report was adopted, with instructions to the Division to endeavor to standardize alloys suitable for die castings.

Roller Chains

The report of the Roller Chain Division comprised specifications for a new series of sizes, which was prepared jointly by the Committee on Roller Transmission Chains of the American Society of Mechanical Engineers, and the Roller Chain Division of the S. A. E. Standards Committee, with the intention of revising and extending the recommendations to cover commercial practice when war production conditions ceased. The Joint Committee had co-operated closely with the Asso-

ciation of British Driving Chain Manufacturers, to the end that American chains might be used on British sprockets and vice versa. Strenuous opposition to the adoption of the recommendation was made by H. S. Pierce of the Link Belt Co. Mr. Pierce, who is a member of the Division, said he had not been able to attend the meeting at which the decision was taken to recommend a new standard. He said that the proposed specifications differed from the sizes now being made in this country and in England. The present sizes had been made for a great many years, and if the new standard was adopted, difficulty would be experienced in supplying spares for old chains and much confusion would result. The only thing to recommend the proposed standard was that its sizes were perhaps a little more consistent than those now in use, but the whole thing was theoretical, and was out of harmony with present practice. As no other member of the committee was present to defend the recommendation, it was decided to return the report to the committee.

Stationary Engines and Lighting Sets

L. S. Keilholtz, chairman, made the report for the Stationary Engine and Lighting Plant Division. This division recommended standard nominal voltages of 32 for $\frac{1}{2}$ to $1\frac{1}{2}$ kw. generators inclusive, 32 and 110 for 2 to 3 kw. generators, and 110 only for 5 kw. generators. Standard engine speeds of 1200 to 1800 r.p.m. were recommended for all sizes. Upon motion it was decided to add the 110 volt standard for the four smaller sizes. Owing to a desire on the part of one member of the Division, expressed at the last moment, to make important changes in the report on the adaptability of the S. A. E. engine testing forms for use with engines burning natural gas, the chairman asked for the return of this part of the report to the Division, and his request was complied with.

The Division also recommended for adoption as S. A. E. recommended practice that flanges for cast iron carbureters be specified as the next largest size for each nominal diameter of opening, given in the S. A. E. Standard for carburetor flanges. Adopted. A list of existing S. A. E. Standards applicable to stationary engine and lighting set practice had been compiled and was presented in the report, and this was approved by the meeting.

Tire and Rim Report

It was proposed by the Tire and Rim Division that the present S. A. E. Standard for pneumatic tires for passenger cars and commercial vehicles be revised to include the $33 \times 4\frac{1}{2}$ and 34×5 in. pneumatic tire sizes, in order to meet the growing demand for 24 in. wheels with $4\frac{1}{2}$ and 5 in. tires. The Tire and Rim Association, at its meeting on Dec. 10, approved the insertion of the above sizes in the standard, and also included the 42×9 in. size. The present S. A. E. recommended practice for the carrying capacity of a 9 in. tire is 5,000 lbs., and that for the inflation pressure, 120 lb. per sq. in.

The recommended practice on pneumatic tire sizes for motorcycles so far has been $2\frac{1}{4}$ and $2\frac{1}{2}$ in. for the BB rim section, and $2\frac{3}{4}$ and 3 in. for the CC rim section. As a result of the experience of the Motor Transport Corps here and in France with motorcycle transportation, and owing to the tendency in commercial motorcycle practice towards a heavy weight machine, the Tire and Rim Division carefully reviewed the subject. General opinion among motorcycle manufacturers is that tires should not be smaller than 3 in. The Division therefore recommended the following three tire sizes for

adoption as S. A. E. recommended practice for motorcycles, all sizes to be used on CC rim sections: 26×3 , $27 \times 3\frac{1}{2}$ and 28×3 . This recommendation was adopted.

With the advent of trailers and semi-trailers as an important factor in the automotive industry, there has also arisen a demand for adequate tire standards for this type of vehicle. It is not at all necessary to have a separate standard for trailer wheels, and the following additions to the present standard sizes of solid tires would meet all requirements: 36×3 , 34×5 , and 34×7 in. These sizes have already been incorporated in the list of standard solid tire sizes of the Solid Tire Manufacturers Division of the Rubber Association of America. The recommendation to add these tire sizes was carried. It was recommended that a 5 in. rim section be added to the present S. A. E. standard, and this recommendation was adopted. An error in the data sheet showing the clincher rim section was pointed out, and a correction was asked for. The radius of the bead, 0.55 in., was shown as the outside radius, whereas in reality it should be the inside radius. A recommendation was made that the S. A. E. Standard for bolt equipment for solid tire flanges be revised to include 32, 34, 36 and 40 in. tire sizes only, thus eliminating the non-standard 30, 38 and 42 in. sizes. It was recommended that the dimension D in the illustration for wood spoke dimensions for commercial vehicle wheels and the letter D in the heading for the column for the nominal spoke sizes be omitted, as this dimension (unfinished thickness of spokes between flanges) is of no interest to automobile engineers.

Belt Speeds for Tractors

Two years ago, the Society adopted a standard belt speed for tractors of 2600 ft. per min. There was great variation in practice at that time, and a little over a year ago it was felt that this standard belt speed would not cover all conditions. Consequently, in February, 1919, a subdivision of the Tractor Division was appointed, which made a careful canvass of the tractor, stationary engine and implement manufacturing industries to ascertain present practice and to bring the industries into agreement. A lengthy report based on this investigation was made to the Division by E. A. Johnston on Oct. 31st. As a result of this investigation, it was recommended that standard belt speeds of 1500, 2600, 3000 and 3500 ft. per min. should be adopted for farm power driving, and power-driven machines of 10 h.p. and over. Adopted.

It was recommended that the present S. A. E. Standard for belt widths be revised so as to include a width of belt for transmitting over 30 h.p. This suggestion was adopted.

Trailer Hitches

The Truck Standards Division, L. P. Kalb, Chairman, made a recommendation regarding hitches for four-wheel trailers. During the war, the use of trailers was greatly extended, and it is, of course, very desirable that all trucks and trailers be interchangeable. The recommendation was drawn in co-operation with the Trailer Manufacturers Association, and as it was found that the United States Government pintle hook was used to a large extent, the report provided for its use. It was not considered desirable to give a fixed distance from the axis of the drawbar head to the ground, as this height is substantially the same for all existing trucks. The lost motion between the eye and the drawbar head should be as small as possible to prevent sway-

ing of the trailers in operation. A spring, preferably mounted in the drawbar head (that part which is on the truck) should be used in the trailer head, and may be either enclosed or exposed. The recommendation

was adopted. The Truck Standards Division also presented a list of existing S. A. E. Standards which are adaptable for truck usage, and this list was approved by the Standards Committee.

S. A. E. Standards Recommended at Winter Meeting

(Continued from page 242, Jan. 15th issue)

Dimensions for Light Series Extra Large Type Fuel Vacuum Tank Mounting and Connections Bearings

No.	BORE		OUTER DIAMETER		WIDTH OF INDIVIDUAL RINGS		CORNER RADIUS	
	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.
224	120	4.7244	215	8.4646	42	1.6535	3	0.12
226	130	5.1181	230	9.0551	46	1.8110	3	0.12
228	140	5.5118	250	9.8425	50	1.9685	3	0.12
230	150	5.9055	270	10.6299	54	2.1260	4	0.16
232	160	6.2992	290	11.4173	58	2.2835	4	0.16
234	170	6.6929	310	12.2047	62	2.4409	4	0.16
236	180	7.0866	330	12.9921	66	2.5984	4	0.16
238	190	7.4803	350	13.7795	70	2.7559	4	0.16
240	200	7.8740	370	14.5669	74	2.9134	5	0.20
242	210	8.2677	390	15.3543	78	3.0709	5	0.20

Widths of Extra-Wide Type Annular Ball Bearings

LIGHT SERIES		MEDIUM SERIES		HEAVY SERIES	
No.	Width, In.	No.	Width, In.	No.	Width, In.
200	$\frac{1}{2}$	300	$\frac{3}{4}$	.....	.....
201	$\frac{1}{2}$	301	$\frac{3}{4}$	.....	.....
202	$\frac{1}{2}$	302	$\frac{3}{4}$	.....	.....
203	$\frac{1}{2}$	303	$\frac{3}{4}$	403	$1\frac{1}{8}$
204	$\frac{1}{2}$	304	$\frac{3}{4}$	404	$1\frac{1}{8}$
205	$\frac{3}{4}$	305	1	405	$1\frac{1}{8}$
206	$\frac{3}{4}$	306	$1\frac{1}{8}$	406	$1\frac{1}{8}$
207	$\frac{3}{4}$	307	$1\frac{1}{8}$	407	$1\frac{1}{8}$
208	1	308	$1\frac{1}{8}$	408	$1\frac{1}{8}$
209	1	309	$1\frac{1}{8}$	409	$2\frac{1}{8}$
210	1	310	$1\frac{1}{8}$	410	$2\frac{1}{8}$
211	$1\frac{1}{8}$	311	$1\frac{1}{8}$	411	$2\frac{1}{8}$
212	$1\frac{1}{8}$	312	$2\frac{1}{8}$	412	$2\frac{1}{8}$
213	$1\frac{1}{8}$	313	$2\frac{1}{8}$	413	$2\frac{1}{8}$
214	$1\frac{1}{8}$	314	$2\frac{1}{8}$	414	$3\frac{1}{8}$
215	$1\frac{1}{8}$	315	$2\frac{1}{8}$	415	$3\frac{1}{8}$
216	$1\frac{1}{8}$	316	$2\frac{1}{8}$	416	$3\frac{1}{8}$
217	$1\frac{1}{8}$	317	$2\frac{1}{8}$	417	$3\frac{1}{8}$
218	2	318	$2\frac{1}{8}$	418	$3\frac{1}{8}$
219	$2\frac{1}{8}$	319	$3\frac{1}{8}$	419	$4\frac{1}{8}$
220	$2\frac{1}{8}$	320	$3\frac{1}{8}$	420	$4\frac{1}{8}$
221	$2\frac{1}{8}$	321	$3\frac{1}{8}$	.....	.....
222	$2\frac{1}{8}$	322	$3\frac{1}{8}$	.....	.....

Ball Bearings

All corner radii in standards for ball and roller bearings must be minimum radii.

The following tolerances are allowed with separable or open type of annular ball bearings:

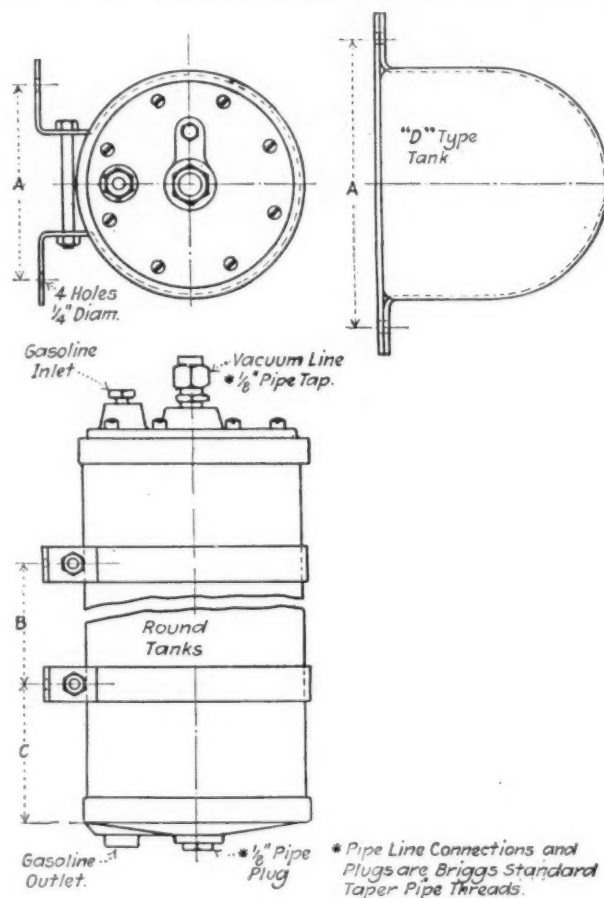
Bore	+ 0.0000, — 0.0005 in.
Outside diameter	+ 0.0005, — 0.0000 in.
Eccentricity	
Inner race	0.0006 in.
Outer race	0.0012 in.

Tolerances for annular ball bearings of extra small type:

Bore	+ 0.0002, — 0.0004 in.
Outer diameter	+ 0.0000, — 0.0005 in.
Width of individual rings	+ 0.0000, — 0.0050 in.

ECCENTRICITY

Inner race	0.0006 in.
Outer race	0.0012 in.



Tank Diameter, In.	¹ Gasoline Inlet	¹ Gasoline Outlet	A	B	C
3 1/4 and 4 1/4	1/4	1/4	4	4	2 1/4
6	1/4	1/4	4	4	2 1/4
"D" type	1/4	1/4	7 1/4	4	2 1/4

All dimensions are in inches.

¹Pipe-line connections and plugs are Briggs standard taper pipe threads.

The pipe-line connections for the vacuum pipe and the gasoline inlets and outlets are Briggs standard tapered pipe threads and conform to S. A. E. Recommended Practice for carburetor fittings.

Spark-Plug Shells

The Society has adopted the suggestion that the thread limits for the present S. A. E. Recommended Practice for Spark-Plug Shells be extended to four decimal places and the millimeter equivalents included. The revision is to provide a definite specification in accordance with good motorcycle engineering practice. This specification together with all other S. A. E. screw-thread standards will probably be more or less affected by the final report of the National Screw Thread Commission. The complete tables follow, the present limits being printed in italics:

Tapped Hole Dimensions

Diameter	MAXIMUM		MINIMUM	
	Mm.	In.	Mm.	In.
Outside (full)		(0.719) 0.7191	18.115	(0.717) 0.7171
Pitch (effective)		(0.674) 0.6743	17.076	(0.672) 0.6723
Root (core)		(0.636) 0.6359	16.101	(0.634) 0.6339

Spark-Plug Thread Dimensions

Diameter	MAXIMUM		MINIMUM	
	Mm.	In.	Mm.	In.
Outside (full)	18.001	(0.709) 0.7087	17.925	(0.706) 0.7057
Pitch (effective)	17.026	(0.670) 0.6703	16.949	(0.667) 0.6673
Root (core)	15.890	(0.626) 0.6256	15.839	(0.623) 0.6236

Voltage and Capacity Ratings

Normal Generator Rating Kw.	Nominal Voltage	Engine and Generator R.P.M.
1/2	32 or 110	1200 or 1800
3/4	32 or 110	1200 or 1800
1	32 or 110	1200 or 1800
1 1/2	32 or 110	1200 or 1800
2	32 or 110	1200 or 1800
3	32 or 110	1200 or 1800
5	110	1200 or 1800

¹Sixteen cells for 32-volt and 56 cells for 110-volt lead batteries.

Bracket Mounting for Generators

The thread for the shaft-end is to be 7/16 in-20 S. A. E. instead of 7/16 in-14 U. S. S.

Flange Mountings for Generators

The shaft-end is now specified as 1/2 in-20 S. A. E. instead of 1/2 in.

Side Lamp Glasses

OUTSIDE DIAMETER OF LENS		MINIMUM LIGHT OPENING IN DOOR	
Nom. Diam.	Tolerances	Nom. Diam.	Tolerances
2	+0, -1/32	1 1/4	+0, -1/32
2 1/2	+0, -1/32	2 1/4	+0, -1/32
3	+0, -1/32	2 1/2	+0, -1/32
5	± 1/64	4	± 1/32
6	± 1/32	5	± 1/32
7	± 1/32	6	± 1/32

Dimensions in inches.

*Also tail-lamp glass.

†Also spot-lamp glass.

Thickness of bezel edge for all sizes is 1/8 in., plus 1/32, minus 0. This is commonly known as double-thick American glass.

This standard is to become fully operative July 1, 1921.

Dimensions for Truck and Tractor Engine Support Arms*

No.	A	B	C	D	E	F	G	R Max	Practice
2T	20	21 1/4	23 1/2	3	1 1/4	1/2	0.625	1/4	Truck and tractor

*For illustration, see page 229, issue of Jan. 15, 1920

Tractor Flywheel Housing

For tractor practice S. A. E. flywheel housings Nos. 1 and 2 are recommended for use with engine support arms Nos. 1 and 2T respectively.

When it is desired to use 1/2 in-13 in place of 3/8 in-16 U. S. Standard capscrews they shall be located on the standard bolt circle, the flange inside diameter remaining the same, but the outside diameter of the transmission case flange may be increased by 1/2 in.

When the outside diameter of the transmission case flange is not finished (as when channel iron supporting pads or brackets are cast over the edge of the flange) the outside diameter of the transmission case flange is increased 1/2 in. over the outside diameter of the standard finished flange. The inside diameter and the bolt circle are to be the same in either case.

Engine Testing Forms

A note be added to the present S. A. E. Standard for Engine Testing Forms stating that they are intended for engines using either gasoline or kerosene fuel.

Crankshaft Grinding Wheel Widths

Nominal Widths, In. ¹	Radius of Edges, In
1 1/2, 1 3/4, 1 7/8, 2, 2 1/4, 2 1/2, 2 3/4, 2 7/8, 3, 3 1/4, 3 1/2, 3 3/4, 4	1/32 in. x.

¹Crankshaft grinding wheel widths are specified by the nominal widths. Grinding wheel manufacturers allow 0.029 in. additional for train wheels.

Cast-Iron Carbureter Flanges

Flanges for cast-iron carbureters are to be made the next larger size for each nominal diameter of opening given in the S. A. E. Standard for Carbureter Flanges.

Approval of Existing S. A. E. Standards

The following S. A. E. Standards and Recommended Practices are approved for stationary engine practice:

Adjustable Yoke Rod-Ends, Plan Yoke Rod-Ends, Eye Rod-Ends, Rod-End Pins, Cotter-Pins, Spark-Plug Shells, Nuts for Machine Screws, Screws and Bolts, Screw Threads, Lock Washers, Taper Fittings with Castle Nuts, Steel Specifications, Valve Metals, Babbitt Metal, Bearing Metals, Brass Casting Metals, Cast Manganese Bronze, Manganese Bronze Sheets and Rods, Hard Cast Bronze, Gear Bronze, Aluminum Alloys, Brass Sheets and Strips, Brass Rods, Tobin Bronze Rods, Non-Ferrous Metal Tubing, Pitch of Silent Chains, Widths of Silent Chains, Roller-Chain Dimensions, Round Tension Test-Specimen, Flat Tension Test-Specimen, Flat Tension Test-Specimen, Shock Test-Specimen, Gray-Iron Test-Specimen, Brinell Hardness Test, Cold-Drawn Seamless Steel Tubes, Steel Bands and Strips, Annular Ball Bearings, Roller Bearings, Fan Belt and Pulley Widths, Disk-Clutch Flywheel Housings, Cone-Clutch Flywheel Housings, Engine Support Arms—Truck, Poppet Valves, Carbureter Flanges, Flared Tube Carbureter Unions, Flared Tube Carbureter Ells and Tees, Carbureter Throttle Levers, Carbureter Air Heater, Carbureter Throttle-Lever Throw, Flexible Metal Tubing, Hand Starting-Cranks, Magneto Dimensions, Ignition Distributor Mounting, Flange Mountings for Starting Motors, Barrel Mounting for Starting Motors, Non-Magnetic Magneto Shims, Magneto Couplings-Flexible Disk, Cable Terminals for Generators, Switches and Meters, Cable Terminals for Starting Motors, Cables for Starting Motors, Starting Motor Pinion, Thermostat Connections, Clamps and Fittings for Rubber Hose, Bases, Sockets and Connectors for Insulated-Return Systems, Oversize Cylinders, Piston-Ring Grooves, Instructions for the Installation and

Care of Storage Batteries Used in Connection with Electric Starting and Lighting Systems on Automobiles, Storage Battery Terminal Posts, Posts for Small Cells, Dimensions of Lead Batteries for Lighting and for Combined Lighting and Starting Service, Temperature Test of Insulating Materials of Electrical Apparatus on Gasoline Automobiles, Fuse Dimensions for Electrical Installation on Gasoline Automobiles, Insulated Cable for Gasoline Cars, Flexible Steel Tubing for Automobile Electric Wiring, Rating of Storage Batteries of Electric Lighting Plants, Voltage and Capacity Ratings of Electric Lighting Plants, Round Pipe Flanges.

Pneumatic Tires for Passenger Cars and Commercial Vehicles

(Additions to List)

NOMINAL TIRE AND RIM SIZE		OVERSIZE TIRE		TIRE SEAT DIAM. (Rim)	
In.	Mm.	In.	Mm.	In.	Mm.
33x4 $\frac{1}{2}$	120/610	24x5	135/610	24	610
34x5	135/610	36x6	150/610	24	610
*40x8	200/610	42x9	225/610	24	610
42x9	225/610			24	610

*The 42x9 in. is an oversize for the 40x8 in. tire.

Pneumatic Tires for Motorcycles

TIRE SIZE		MAXIMUM LOAD		CORRESPONDING INFLATION PRESSURE	
In.	Mm.	Lb. per Tire	Kg. per Tire	Lb. per Sq. In.	Kg. per Sq. Cm.
26x3	75/535	325	147.5	40	2.81
27x3 $\frac{1}{2}$	90/535	400	181.4	45	3.16
28x3	75/560	325	147.5	40	2.81

The maximum loads and corresponding inflation pressures are already S. A. E. Standard.

Solid Tire Sizes

(Additions to List)

In.	Mm.
36x3	75/762
34x6	150/711
34x7	175/711

Solid Tire Sections

The S. A. E. Standard for Solid Tire Sections has been completed by inserting the area of 5 sq. in. for the 3-in. tire size.

Bolt Equipment for Solid-Tire Side Flanges

The S. A. E. Standard for Bolt Equipment for Solid Tire Side Flanges has been revised to include the 32, 34, 36 and 40-in. tire sizes only, thus eliminating the non-standard 30, 38 and 42-in. tire sizes.

Wood Spoke Dimensions for Commercial Vehicle Wheels

Dimension *D* in the illustration for wood-spoke dimensions for commercial vehicle wheels and letter *D* in the heading for the column for the nominal spoke size are to be omitted.

Tractor Belt Speeds

Standard belt speeds are 1500, 2600, 3000 and 3500 ft. per min. for farm power-driving and power-driven machines of 10 hp. and over.

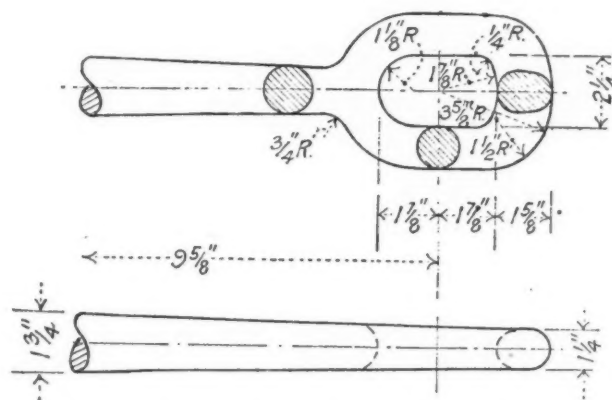
Tractor Belt and Pulley Widths

Horsepower	Pulley Width, In.	Max. Belt Width, In.
10 to 20	4 $\frac{1}{2}$ or 6 $\frac{1}{4}$	4 or 6
20 to 30	7 $\frac{1}{2}$	7
Above 30	8 $\frac{1}{2}$	8

Trailer Hitches

A spring, mounted preferably in the drawbar head, shall be used in the trailer hitch and may be either exposed or inclosed as desired by the manufacturer.

Provision shall be made for chains or other safety devices in addition to the coupling link.* A $\frac{5}{8}$ -in. chain eye clevis with a $\frac{3}{4}$ -in. bolt shall be provided for attach-



Dimensions for proposed trailer eye

ing a safety chain, the clevis to be located directly under the axis of the drawbar head or as near to this position as possible. (If placed above the axis it is likely to interfere with operation of the drawbar head.)

The axis of the drawbar head shall be located, both vertically and horizontally, approximately in the center of the frame of the chassis.

The eye[†] for the coupling link shall conform to the dimensions given in the illustration.

The coupling link shall carry the eye, but when no coupling link is used the eye shall be mounted on the trailer head.[‡] The eye shall be free to rotate so that it can be placed in either a horizontal or vertical position. When the drawbar head can be rotated the eye on the coupling link or trailer head shall be locked so as to prevent it from rotating.

Motorboat Control Levers

For spark and throttle control levers for motorboats intended for one-man control, the spark lever should be shorter than the throttle lever and both should be mounted on stationary sectors. The sectors should be placed so that the levers are moved forward or upward to advance the spark or to open the throttle.

The gearshift lever should be placed so that it is moved forward to pass from neutral to ahead and backward to pass from neutral to reverse.

*That part which is on the truck.

†That part which is between the truck and the trailer.

‡This size of eye will take the U. S. Government pintle hook.

§That part which is on the trailer.

for Rubber Hose, Electric Bulbs for Ground-Return Systems, Electric Bulbs for Insulated-Return Systems, Electric Incandescent Lamp Voltage, Bulb Sizes, Focusing Length of Incandescent Lamps, Tail-Lamp Glasses, Head-Lamp Socket, Focusing, Head-Lamp Reflectors, Head-Lamp Nomenclature, Head-Lamp Lighting Nomenclature, License Plates and Brackets, Location of Numbers, Weight of Car, Three-Speed Gearshift Positions, Four-Speed Gearshift Positions for Motor Trucks, Motor Truck Control-Levers, Oversize Cylinders, Piston-Ring Grooves, Instructions for the Installation and Care of Storage Batteries used in Connection with Electric Starting and Lighting Systems on Automobiles, Storage Battery Terminal Posts, Posts for Small Cells, Storage Battery Compartment, Insulation Requirements of Electrical Apparatus after Installation on Gasoline Automobiles, Ratings of Lead Batteries for Lighting and for Combined Lighting and Starting Service on Gasoline Automobiles, Addition of Electrical Appliances to Gasoline Automobiles, Specifications for Ground Return Electrical Installations on Gasoline Automobiles, Temperature Test of Insulating Materials of Electrical Apparatus on Gasoline Automobiles, Fuse Dimensions for Electrical Installation on Gasoline Automobiles, Insulated Cable for Gasoline Cars, Flexible Steel Tubing for Automobile Electric Wiring, Leaf Spring Nomenclature, Leaf Point Nomenclature, Finish of Springs, Leaf Points, Center Bolts, Rebound Clips, Spacers and Bolts, Frame Brackets, Offset and Resulting Ends, Leaf Spring Specifications.

Head-Lamp Illumination

The head-lamps shall be arranged so that under normal conditions of loading:

The light produced at a distance of 100 ft. directly in front of the head-lamps and at a height of 60 in. or more above the level surface on which the automotive vehicle stand shall not exceed 2400 apparent candlepower.

The light produced 100 ft. ahead of the vehicle and 7 ft. or more to the left of its axis and at a height of 60 in. or more above the level surface on which the vehicle stands shall not exceed 800 apparent candlepower.

Aluminum Alloys

Specification No. 30

Per cent of aluminum, not less than	90.00
Per cent of copper	8.5 to 7.0

All other elements are not to exceed 1.7 per cent, and of this amount not over 0.2 per cent shall be zinc. No other elements except silicon, iron, manganese and tin shall be allowed.

Specimens of this alloy having a diameter of about 1/2-in., cast in sand and tested without machining, should show a tensile strength of about 18,000 to 20,000 lb. per sq. in., with an elongation of 1 to 2 per cent in 2 in. This light alloy, with a specific gravity of about 2.83, is used in the automotive industries to a greater extent, perhaps, than all the other light cast alloys combined. A shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs. This alloy is used for crankcases, oil-pans, steering-wheel spiders, differential carriers, transmission cases, camshaft housings, hub-caps and similar parts.

Specification No. 31

Aluminum, not less than, per cent	81.00
Copper, per cent	3.25 to 2.25
Zinc, per cent	14.5 to 12.5

All other elements shall not exceed 1.7 per cent. No other elements except silicon, iron, manganese and tin shall be allowed.

The tensile strength of test specimens* about 1/2-in. diameter of this alloy cast in sand and tested without machining off the skin should be about 25,000 to 30,000 lb. per sq. in. with an elongation of more than 1 per cent in 2 in.

The specific gravity is about 3.0 and a shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs.

This alloy is used extensively in England for such parts as crankcases, oil-pans, steering-wheel spiders and transmission cases.

Specification No. 32

Aluminum, not less than, per cent	85.5
Copper, per cent	13.5 to 11.00

All other elements shall not exceed 1.7 per cent. The zinc shall not exceed 0.2 per cent. No other elements except silicon, iron, manganese and tin shall be allowed.

The tensile strength of test specimens about 1/2-in. diameter of this alloy cast in sand and tested without machining off the skin should be about 19,000 to 23,000 lb. per sq. in. and the elongation will be practically nothing.

The specific gravity of this alloy is about 2.95 and a shrinkage of 0.156 (5/32) in. per ft. should be allowed in pattern designs. This alloy is used for manifolds, pumps, carbureters, cylinders, and other parts which should be free from leaks and where the brittleness of the alloy is not objectionable. This alloy is also used extensively for pressure die castings.

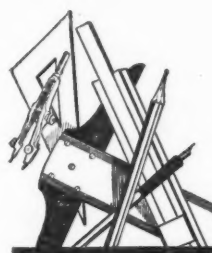
Atlas for Exporters

AN interesting geographic, economic and commercial atlas of Latin America has recently been published by the General Drafting Company. This "Atlas America Latina" is designed primarily as an aid to exporters and contains definite and valuable information concerning nearly every phase of the Latin American countries in which the exporter is interested.

The text material is supplemented by a number of detailed maps which show in graphic form the mineral deposits, climate, languages, principal products, and exports and imports of each of the Latin American countries.

Numerous graphs show clearly the trend of commercial relations between the United States and its Latin American neighbors. A particular feature of these charts is that space is left to carry out the curves for several years to come.

The introductory note indicates that the publishers intend putting out revised editions in the future. This atlas is unique in the conciseness and utility of the information which it contains, and should be a valuable reference work for exporters or those contemplating trade relations with these countries.



The FORUM



Gas Turbines

Editor Automotive Industries:

PROF. NORMAN'S recent article on the possibilities of an aeronautical gas turbine was of particular interest to me, because of my work, extending over a number of years, in developing a type of gas turbine different from those outlined; but my conclusions with reference to the advantages to be gained are considerably at variance with those given in the article.

The greatest advantage in the gas turbine—especially for aeronautical use—is its probable length of "life" in open-throttle work; we might expect from 10 to 20 times the life in service of any poppet valve engine yet produced. Consider what that means in increasing flying endurance!

Then, the two-wheel expansion type of turbine, which is being developed, does not have a valve of any type, and is of simpler construction than any four-cycle engine of the usual types. There is simplicity—less to construct and maintain—lower cost per horsepower developed, and the weight per horsepower should not be far from one-half that of present valve engines. Elimination of vibration, through mechanical balance in the turbine, will contribute to the life of the plane. There are other marked advantages to be enumerated.

The expansion turbine referred to is designed on the following fundamental ideas:

(a) The efficient gas turbine must be of the *expansion* type—as opposed to the "continuous combustion" type, using a simple vaned wheel and working by impact of the gas on the wheel as in the conventional steam turbine.

(b) There must be compression of the gas to, say, 90 to 135 pounds pressure, according to size and intended use, and

(c) Compression must be carried out *within the wheel casing*, which in this case is attained by a construction involving two packed wheels, revolving at different speeds. No outside compressor or outside heat loss is to be tolerated; an *internal combustion* turbine must be produced.

(d) No valves of any type are to be used, simple metallic packing having the general characteristics of a piston ring being employed instead of valves to seal ports in the wheel against loss of pressure.

The compression is carried to the maximum allowable in present aeronautical engines, and the working temperature may be kept even higher than that of present reciprocating engines having valves—in fact, *may be controlled* to a considerable extent by design, i.e., air-cooled engine temperatures may be maintained in water-cooled turbines. Or, on the other hand, the turbine wheels passing over considerable more surface of the casing than is possible to provide in stationary engine cylinders may be air-cooled in quite large sizes (by cooling the casing), effecting

weight reduction as figured for the entire water-cooled plant, viz.: engine, radiator and piping.

Turbines can also be built in large or very small sizes, as low as 15 or 20 hp. if desired, and possibly up to 200 hp. in single wheel-set constructions, and it is conceivable that the over-all efficiency will run slightly higher than that of engines of other types, on account of higher mechanical efficiency possible for the turbine.

Then, by assembling wheel-sets or "rotors" in multiple on one shaft, a considerable range of power plants can be obtained from simple units of "standardized" parts. For instance, a 100 hp. unit can be multiplied to give 200, 300 or 400 hp. without undue complication or an excessive number of parts.

With the two-wheel turbine, from 8,000 to 10,000 "expansions" or impulses can be obtained at the "peak of the curve" with a main shaft speed of approximately 700 to 800 r.p.m. with a construction having the simplicity of a four-cylinder, four-cycle engine minus valves and valve mechanism. In short, the power to be obtained from high-speed action of the working parts, but with the main turbine shaft running at an almost ideally *low* speed for a direct-connected propeller, is a most desirable and distinct feature of a turbine of this type.

My experiments show that such a turbine is more quiet at high than at low speeds, the range of speed being very wide.

With reference to the Holzwarth turbine, Dugald Clerk is quoted as stating some years ago, when that turbine was being discussed, "the theory of the Holzwarth machine does not appear to me to permit more than a 10 per cent heat conversion, and so far as I understand Mr. Holzwarth's results his actual conversion is much less than this."

Holzwarth's claims for thermal efficiency (as high as 30 per cent) with a turbine using a compression pressure of only about two atmospheres, as disclosed by articles on the subject (and giving maximum explosion pressures of only 90 to 105 lb.), do not seem reasonable; it could hardly be expected to show anything like the 20 per cent thermal efficiency indicated by Prof. Norman, and which, from time to time, has been claimed for the Holzwarth turbine by other writers, basing such conclusions on Holzwarth's unconfirmed figures. Nor would the curve given in Fig. 3 of Prof. Norman's paper indicate that such efficiency were at all possible with such low compression pressures.

Such statements of efficiency, giving erroneous impressions of the possibilities of gas turbines working on the lines of "flame impinging on turbine blades," should be verified by some impartial tests, it seems to me, before being repeatedly made.

I do not know what type of gas turbine the German firms are developing, but in 1916 I received a proposition from Berlin to build large aeronautical engines from my own turbine designs (having applied for German patents early in 1914) and considerable interest was displayed at that time by one German firm.

A. J. PAGE.

Interest in Work a Vital Factor in Fatigue Studies

Mr. Tipper brings to light a neglected, yet important, phase of fatigue study, which must be taken into consideration by industrial managers. The importance of this newly recognized factor is proved by the results of extensive tests made by Mr. Tipper with various workers over long production periods and under varying conditions

By Harry Tipper

THE question of fatigue is one of the most important questions in all production work, and many thousands of observations have been made by competent observers from the ranks of the medical and the engineering professions. A good number of books have been produced outlining this subject, while the governments of England, France and the United States paid considerable attention to the matter of fatigue during the war.

The usual method of measuring fatigue is by taking the production curve for the working period, either by hours or by more frequent readings.

Production curves so calculated show a characteristic rise from a low point at the beginning of the morning's work, to a maximum production in the middle of the working period, and a decrease again toward the end of the working period. The curve in the afternoon always starts more nearly the maximum if not at the maximum, and the drop toward the end of this period is usually longer with a lower point at the finish.

In other words, when the worker begins in the morning, it takes a little time for maximum production to be reached on account of the necessity for securing concentration upon the work, for arriving at the proper co-ordination of brain and hand and the swinging of the whole energy into the required rhythm. As soon as this is secured the work rapidly reaches maximum and continues approximately at that point until fatigue begins to set in, with the protective tendency toward the reduction of speed.

After Lunch Period

After the lunch period the concentration is secured almost immediately, and the rhythm so much more readily that the drop from maximum is very small, so that the curve in the start of the afternoon period usually shows something approaching the maximum from the beginning. The rest at the noon hour has not provided, however, the complete recuperation which is secured overnight, and the drop from maximum is usually longer, starting at an early part of the working period and continuing to a lower point than in the morning.

It has been assumed by the medical writer and the industrial observers that the production curve told the whole story of fatigue, and the working hours from a health standpoint have been judged entirely in respect of the production curve. This assumption, however, leaves out of count some important factors without which the character of fatigue cannot be determined properly.

The Character of Fatigue

There is, of course, an individual variation in physical capacity, in mental strength and in suitability to any particular work, which means that the individual production curves vary through the number of operators engaged upon any one operation. These variations can be calibrated so as to secure an average curve which respects the condition to be accepted in the mass. These average curves again vary in relation to different operations, to different classes of work and to different lengths of working periods. They also vary greatly as between men and women.

From an examination of such curves and a digest of a number of them made at different periods of the year, and under different surrounding conditions, indications can be taken showing the suitability of the working period, the value of the rest period and the effect of the overnight recuperation. Unfortunately, however, there are no indications whereby the potential capacity of the worker can be determined or the relation of the actual output to that potential capacity be discovered. Hence, the efficiency of the means which are taken to overcome the indicated fatigue cannot be fully calculated.

Efficiency argues the knowledge of the theoretical possibilities of work, and therefore, a determination of the percentage of actual performance in terms of this theoretical possibility.

The loose statements which are made as to the efficiency of workers upon certain operations are without any scientific basis, and until we have determined the effects of the psychological factors in connection with output, this efficiency will remain only a term and not a calculation of real value.

Effect of Interest in Work Upon Fatigue

Neither the medical man nor the industrial observer have attempted to determine the effect of interest in the work upon the actual fatigue. Although every individual who has analyzed his own reactions at all intelligently is aware that when the interest is in harmony with the work and its object, not only can the output of work be increased but the fatigue will be lessened and recuperation through the rest period will be greater. These facts have been left entirely out of the calculation of the medical man and the industrial observer in dealing with this subject of fatigue. It is not merely that an objective in connection with the work, or an interest in its accomplishment turns more of the potential power into actual performance, but that it reduces the friction in the machine itself, and the wear and tear on the machine, so that the actual physical fatigue is lessened and the recuperation more thoroughly valuable.

In many thousands of observations under very different conditions of work, some years ago, I found it possible to trace the effect of the incentive upon the physical condition, by transferring the same worker from light highly repetitive work to much heavier variable work, where the interest was greater.

I discovered through curve after curve calculated in the same way that the fatigue was lessened because of the increase of interest, even though the actual physical requirements of the work were harder.

This part of the subject of fatigue, in fact, presented so many interesting factors of investigation that all the later observations were made with a view to arrive at some conclusion concerning it. These observations established one or two points which are of importance in connection with the present industrial organization, the demand for shorter working hours and some of the other troubles that are being experienced at present.

Muscular Effort in Relation to Fatigue

The first point established was that highly repetitive work requiring only slight muscular effort and slight mental effort resulted in an accumulated fatigue so definite that only a few days were necessary for a new operator to establish a minimum rate of production. It was further determined that where bonuses or other systems of remuneration were established to increase the rate of production on such work, the result in six months was to re-establish the minimum rate or to increase with considerable percentage the number of absences and the accidents from lack of judgment.

Another point which was secured in connection with this work was the fact that fatigue is not proportional to the muscular effort required, but is affected much more definitely by the rapidity and regularity of that fact. This has been considered, of course, by the medical men in their experiments upon muscles and nerves for fatigue under repeated activity, but the extra fatigue created by the discontent with the work and the desire to escape from it have not entered into these calculations.

Turnover Due to Lack of Incentive

The third point which came out of the observations mentioned was the fact that turnover is directly associated with the lack of incentive in the work from its monotony of repetition or its disagreeable character, and that this turnover was due largely to the psychologi-

cal fatigue. If the industrial and medical observers had made their observations without assuming that the medical effects upon the muscles and nerves were the only ones to be considered, the experiments which have been conducted in the past would have brought results more commensurable with the care which has been spent upon the calculations.

But some of the most important indications as to the reason for turnover, for enforced absences, for minimum rates of production and for discontent, have been missed entirely because of the assumption that fatigue was purely a mechanical action upon the nervous system and the muscular system.

Manager Needs Complete Data

For the purpose of state and national legislation, which concerns itself with protection of public health, the mechanical effects shown on the production curve are sufficient in themselves, and there is no necessity to search for indications of the psychological features; for the industrial manager, however, who is concerned with understanding every difficulty that limits his production per worker, per hour, such conclusions are only the beginning of the investigation instead of the end of the calculation.

One of my well informed friends the other day remarked that the superstitions of the laboratory are as bad as the superstitions of the jungle, and the keener the examination of scientific analysis the more difficult it is to understand how indications should have been missed merely because the investigators assumed that the *prima facie* factors were the only ones.

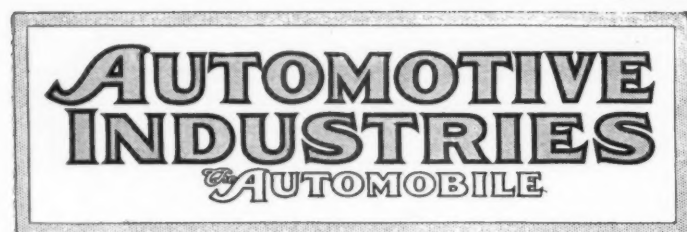
Use of Primary Factors

The works which have been written upon fatigue and efficiency in terms of fatigue are useful in indicating some of the primary factors that affect the productiveness of the worker. They would be of much greater value, however, to industry if they were read for what they do not indicate and for what they might indicate, as much as for the things which they explain.

At no point in this examination of the worker in relation to his work can the psychological factors be neglected without so limiting the result as to make it almost worthless.

Particularly is this the case where the examinations are concerned with the reactions of the individual to his work, as expressed in the volume of production per hour during the working period. Wherever the rotation of work has been tried, one of the most important results has been the increase in the contentment and satisfaction of the worker shown in the increase in production and the less in turnover.

The actual physical requirements of the work which must be done by each worker in rotation are no less severe in this kind of individual physical effort than those encountered in repeating the same operation. The psychological requirements, however, are entirely different, and the effort of this difference upon the physical reaction is very marked. Examinations into the question of fatigue by the use of production curves are of value in a general way; they can be made of much greater value to the individual concern and to the particular industry if they are carried further and taken with sufficient care to determine something of the psychological reactions as well.



PUBLISHED WEEKLY
Copyright 1920 by The Class Journal Co.

Vol. XLII

Thursday, January 22, 1920

No. 4

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United States and Mexico ----- One Year, \$3.00
Extra postage west of the Mississippi River on account of Zone Postage Law, 0.50
Canada ----- One Year, 5.00
Foreign Countries ----- One Year, 6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft.
Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; W. H. Taylor, Treasurer; A. C. Pearson, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Business Legislation Needed

DESPITE the knowledge that pre-war conditions are unlikely to return and the post-war condition practically ushers in a new era for industry, Congress has been exceedingly slow to enact the legislation demanded by present-day problems. It is acknowledged everywhere that the anti-trust laws, which were perhaps of great value twenty years past, are to-day as obsolete as a two-cylinder automobile. These are days of power and action when twelve cylinders are none too many, and industry should be encouraged, not hampered, by legislation.

There is a bill in Congress, introduced a year ago and still awaiting action, which would allow industry considerably more freedom. This is a bill by Congressman Steele, and would allow industrial companies to know definitely whether or not they need fear prosecution from the Government because they are combines or "trusts."

The bill would authorize corporations to apply for a license from the Federal Trade Commission to transact interstate commerce. The application would contain full information as to the intentions of the

concern, and the Federal Trade Commission would have the power to inquire as to whether or not they were engaged in "unreasonable or unfair restraint of trade or commerce," with the result that if satisfied the Commission would issue a license under which the corporation would definitely be assured that it could proceed without interference from the Government.

Steering Joints—A Promising Object of Standardization

THE great majority of cars employ ball type universal joints at both ends of the steering drag link. Sometimes the ball is turned directly on the end of the arm to which the drag link connects—sometimes it is made a separate part which is fitted to the steering arm by a taper joint and nut. Where the steering arm is of simple shape, which is generally the case with the rear arm which extends downward from the shaft of the steering worm gear, the preference seems to be for the integral ball, because with a certain amount of metal, and therefore a certain weight, a more secure job can be obtained by turning the ball on the arm itself, which operation involves no serious difficulty. But in the case of the front arm, secured to the steering knuckle, which is sometimes of very irregular shape, it is generally necessary to use a separate ball stud.

One advantage of the separate ball stud resides in the ease with which it can be case hardened. While it is possible to carbonize the integral ball, this involves considerable extra work, owing to the fact that it constitutes only a small part of the steering arm.

As ball joints are so extensively used for this purpose, it would undoubtedly be a good plan to standardize them as to ball diameters and diameter of stud at the neck. For separate ball studs the standardization could be carried further, covering length of shank, taper of shank, distance from center of ball to beginning of taper, length of threaded portion, pitch of thread, location and size of cotter pin hole. If such standardization were carried through it would make ball studs universally interchangeable, which would be a convenience where a stud had to be replaced due to accident, etc., and it would also tend to cheapen the manufacture of these parts.

Aircraft as a Utility

IT is an interesting coincidence that in the same week:

The House of Representatives eliminated from the Post Office Appropriation Bill all allowances for air mail service, and

The First American Post-War Aircraft Show was held in Chicago. At this show more than 1000 machines were sold for private use.

These machines were bought for many uses. Ranchmen in the West and in Cuba were heavy buyers. They will use the machines for patrolling their extensive fields. Some Westerners bought them be-

cause they live 100 miles from a railroad, by mountain roads, which handicap the automobile. Oil men bought freely, expecting to use the machines in travel from one field to another. A good many former pilots bought machines to establish quick transportation between definite points. Only a small proportion of the machines, it is said, were bought for sport and amusement purposes.

Yet the House of Representatives believes that they are a luxury.

"We Licked Them"

SPEAKING of the recent printers' strike in New York, Mr. H. M. Swetland, President of the United Publishers' Corporation, said: "Some people like to say 'We licked them'; that is not the right spirit. A licked man is always ready for another fight. We constantly see, these days, the phrase 'Capital vs. Labor.' We cannot get a solution to our industrial problem until someone finds a way to take that *vs.* from between Capital and Labor."

"A licked man is always ready for another fight." This is a significant phrase, since it visualizes in a vivid way one of the most important factors in the present industrial situation. Whether the licked man is employer or employee makes little difference when the one which gains his demands swaggers about boasting of a victory. No one likes to lose, but the good sportsman swallows his regret with a smile and buries any bitterness in the depths of good fellowship. To do this is impossible, however, when the "winner" violates all the rules of sportsmanship by gloating over his gains. Such conduct is unpardonable even in the comparatively frivolous realm of sport; in the very serious business of industrial life it is abominable.

To the exercise of this spirit of making industrial relations a bitter struggle is due in a large measure to the unpopularity of the most powerful labor organizations. The "power of labor" has become an all too familiar phrase, and its reiteration by labor leaders is not hastening the advance of industrial peace.

The employer who is able to gain his just ends in a dispute with his employees, and then refrains from saying "We licked them," has caught that spirit of broad-minded co-operation which will eventually solve our industrial problems.

The big men of America are rapidly catching that spirit. Some of the smaller men have not. One minor executive of an Ohio manufacturing concern, for instance, wrote recently, "The workers of this country are about due for a good bumping of heads or something that will bring quicker action." Among other duties, this man is Superintendent of Welfare of his plant. It is difficult to imagine the spirit expressed in this sentence bringing about co-operation between employer and employee. Even the best and most conservative worker must resent such a statement.

We must by some means get the *vs.* from between Capital and Labor. The best means of doing it will probably need to be worked out between the man-

agement and workers of every plant. Taking out the *vs.*, however, must of necessity consist of a series of adjustments and settlement of differences. When any adjustment has been made, the side which seems to have gained by the adjustment must regard their gain as one of justice—not one of might. The "We-licked-them" spirit, whether in labor or in capital, can never gain permanent success.

Truck Legislation

THE National Automobile Dealers' Association is calling attention to the situation that results from the truck transportation lines being placed under the Public Service Commissions and to various State laws that apparently have been passed with a view of protecting the transportation lines now in existence.

The situation appears to put a heavy handicap on the projector of a truck transportation line. The California and Nevada laws take the position that it rests entirely upon the truck owner to prove that a public necessity exists before he will be allowed to compete with the existing systems of transportation. The promoter of the new system of transportation is not permitted to prove that he can better serve the public or to establish himself by actual competition.

Public Service Commissions, it appears, have long been associated with steam and electric railroad transportation, and their sympathies run in this direction. In Nevada a truck line was opposed with this argument: "Let the trucks run and we will have to quit running the railroads. We pay big taxes that the landowners would have to pay. If the railroads stop running it will mean the ruination of the country."

What could be more silly as an argument?

In Massachusetts the N. A. D. A. is informed that the street railroad companies have united to fight passenger buses. An assessment of 25 cents on each share of railway stock has been made to carry on this fight.

These instances outline a situation that is worthy of the best attention of the automotive industry. The situation is not a local one, but should be regarded as a trend of legislative thought. Also it should be remembered that transportation interests have long been a power in legislation. But the automotive industry has the power to fight for its rights if it is aroused.

Future Street Transportation

THE motor passenger bus would seem to have made good in New York. Last week the Broadway Association, composed of merchants, voted on whether they wanted street car or bus transportation on the street of white lights. More than 80 per cent of the votes were for buses, 15 per cent for street cars and the remaining ballots were blank. In New York regularly established bus lines have been well tried out and this verdict would not appear to be merely an experiment.

Dunlop to Specialize On Cords and Solids

Manufacturing and Sales Organizations for New American Plant Nearing Completion

NEW YORK, Jan. 19.—Announcement of the production and sales plans of the Dunlop America, Limited, an American company which purchased recently a large tract in Buffalo to manufacture and sell the Dunlop tire, is awaited in the industry with much interest.

Officials of the new corporation are withholding the announcement of the plans to complete some details, but the fragments of information that the activities of the company disclose promise an auspicious start for the Dunlop organization in the United States.

The industry has been taken into the confidence of the Dunlop company in a recent statement to this extent: Dunlop America, Ltd., as an American company will be operated by an American staff. The board will include a strong American element, as well as some of the chief members of the board of the British company, and will have the benefit of full interchange of patents and technical processes with the British and other Dunlop companies, as well as the services, free of cost, of an advisory committee constituted from the expert staff of the British organization.

Cord fabric, which will be exclusively used, will be spun, twisted and woven from the raw cotton in a specially designed cotton plant adjoining the rubber plant to be erected on the 150 acre Buffalo tract. In accordance with the Dunlop specialization ideal, the production will be limited—with one exception, the Dunlop golf ball—to cords and solid truck tires identical in quality with those Dunlop tires which carried the bulk of the British army transport during the war.

Capitalized in England

Capital for the erection of the initial unit of the plant for the new American enterprise was provided independently by the issue in England some few months ago of \$20,000,000 of common stock convertible into common stock of the American company when formed.

Associated with the British Dunlop company in this issue were James White, of London, and W. P. Bonbright & Co., Inc., bankers of New York and London. This stock has since been dealt in in England at a premium over 100 per cent.

A commission including some of the principal executive members of the board of the British company, accompanied by a staff of experts, arrived here late in November, 1919, and has been actively engaged in making preparations for the creation of the new tire plant.

Thirty years ago the first pneumatic tire ever put to practical use—the original Dunlop from which has grown the gigantic tire industry of to-day—was brought to the United States by the late Harvey

du Cros, president and founder of the Dunlop company.

The American Dunlop Tire Co., founded by the original company to exploit the pneumatic tire in the United States, manufactured Dunlop tires here for many years, and having had a successful career, was merged in a large consolidation after the parent company had sold its interest in it some twenty years ago. The original British company, with its subsidiary and allied companies, continued to develop the Dunlop tire throughout the rest of the world with such success that Dunlop is to-day the largest tire organization in the world outside of the United States.

Plants Cover the World

There are Dunlop tire plants in England, France, Japan, Canada and Australia; Dunlop rubber plantations in the Malay Peninsula and Ceylon comprising 60,000 acres of rubber lands—the largest unit of rubber estates owned by any one concern in Europe; and Dunlop cotton mills in Rochdale, England, with 350,000 spindles, having the largest production in Europe.

The current market value of the British company's capital is approximately \$100,000,000, the common stock standing at a premium of about 900 per cent. A new issue of \$5,000,000 common has just been made at a premium of 700 per cent, and is being taken by existing holders.

Recommends Gasoline Fire Dept. Apparatus

COLUMBUS, OHIO, Jan. 19.—Safety Director John P. McCune has recommended to the city council that all of the steam fire engines in the Columbus fire department be abandoned for gasoline pumping apparatus. At present some of the engine houses are equipped with tractors to haul the old steam pumpers. Because of the shortage of men and higher cost of operation the recommendation is made. An ordinance was introduced in the city council to authorize the issuance of \$110,000 bonds to provide for the change.

CONVENTION AT WALDORF

NEW YORK, Jan. 16.—The Material Handling Machinery Manufacturers Association will hold an open convention at the Waldorf-Astoria for two days, Jan. 29-30.

Manufacturers from all parts of the country who make cranes, hoists, winches, portable, gravity and power conveyors, industrial trucks, tractors and trailers, bulk handling machinery, elevators, motors and electrical control apparatus, batteries, ball bearings, hand lift trucks, etc., are expected to attend.

APPOINTED DISTRIBUTER

NEW YORK, Jan. 17.—The Lincoln Electric Co., Cleveland, has been awarded the exclusive distribution of Lincoln Electric Motors for industrial applications.

Ordnance Dept. to Sell 980,000 Lbs. of Steel

WASHINGTON, Jan. 16.—The Director of Sales of the War Department is offering for sale 980,000 lbs. of steel at the Dodge Brothers' Detroit plant, bids for which are invited and may be addressed to the District Ordnance Office, Detroit.

Included in the material are flat, round, square and hexagon cold rolled stock, flat, round and square machine steel, round and flat screw stock, hot rolled rounds and round forging steel in various sizes—mostly commercial grades. Offers for all or any part of this material by letter or telegram will be accepted. A more detailed description of the steel may be obtained from the Detroit Ordnance Office.

Contract for Space At N. Y. Aircraft Show

NEW YORK, Jan. 16.—Space for the second annual aeronautical exposition to be held in the Seventy-first Regiment Armory, New York, March 6 to 13, is now being contracted for. The show will be under the auspices of the Manufacturers Aircraft Association, Inc., and will be under the management of Walter Hempel, with C. J. Younger assisting. The show committee is comprised of A. H. Flint, of L. W. F. Engineering Co., president and chairman; Englis M. Uppercu, Aeromarine Plane & Motor Co., and F. H. Russell, Curtiss Engineering Co.

Defines Federal Tax On Public Hire Cars

WASHINGTON, Jan. 16.—The special Federal tax on passenger automobiles operated for hire has been defined in a ruling by the Internal Revenue department. Taxes are fixed at \$10 for each automobile of a seating capacity of from two to seven, and \$20 for each automobile with a seating capacity of more than seven. In computing seating capacity the driver's seat is to be included. Motor trucks used for passenger carrying are liable to taxes under the prescribed rates. Automobile ambulances and automobile hearses are not considered passenger automobiles and are not taxable.

MAY NOW SUCCOR AIRMEN

WASHINGTON, Jan. 16.—The bill which authorizes the Secretary of War to sell gasoline, oil and other aircraft supplies at cost to civilian aviators in distress, and which they need for the continuation of their journeys, was passed by the Senate yesterday. The bill authorizes the sale at contract price plus 10 per cent, and limits the amount of supplies to be sold to quantities which will enable the aviator to get to the nearest point where they can be purchased, and when it is impracticable to obtain the supplies in the vicinity of an Army aviation post at which he applies.

Hexman Moto to Make Carbureter Controller

RACINE, WIS., Jan. 19—The Hexman Moto Co. of Racine, Wis., has been incorporated with an initial capital stock of \$30,000 by six department heads of the Mitchell Motors Co. of Racine, to engage in the manufacture of a hot air controlling device for carbureters, designed and patented by Fred Haumerson, also a member of the Mitchell organization. The device will be marketed under the trade name of "Hexman." A factory has been leased and is being equipped.

The officers are: President, C. W. McDowell, who is general superintendent of Mitchell; vice-president, F. C. Deacon, superintendent of tools, jigs and fixtures; secretary, E. R. Jacobi, chief inspector; treasurer, David Hansen, assistant superintendent. B. T. Hain and William Almes, division superintendents, are directors.

Haumerson has sold his patents outright to the Hexman company. The device provides automatic control to feed hot air to the carbureter at low motor speeds and cold air at high speeds, effecting an economy equivalent to from 6 to 8 per cent in fuel consumption.

Another Advance in Price of Gasoline

NEW YORK, Jan. 16.—Gasoline prices soared another cent a gallon in the New York and New England districts this week.

The Standard Oil Co. of New York has advanced the price to 26½ cents, wholesale. This is the second advance of one cent within a few days in these districts. In the first increase the entire Atlantic Seaboard, from New Jersey to Florida, was affected. The Standard Oil Co. of Indiana, the largest marketer of gasoline in the country, has not announced an advance in price yet.

The Texas Co. also announced an advance in gasoline of one cent a gallon in Alabama, Florida, Georgia and Mississippi. Kerosene prices were advanced one cent in the same district.

TRADE OPPORTUNITIES

WASHINGTON, Jan. 17—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign and Domestic Commerce and specify the Foreign Trade Opportunity number.

A merchant in Germany desires to purchase and secure an agency for the sale of novelties in accessories and equipments in the automobile and airplane industries. Correspondence may be in English. Reference, 31702.

A retail dealer in France desires to purchase bicycles and accessories, motorcycles, light motor cars, trucks and ac-

cessories. Correspondence may be in English. Reference, 31700.

An agency is desired by a man in Italy for the sale of automobiles and accessories. Correspondence should be in Italian or French. Reference 31709.

A firm in India proposes to start a freight and passenger transportation service and desires to purchase or secure an agency for a large number of motor trucks and passenger cars. Quotations should be given f.o.b. New York. Reference, 31726.

An engineer from Sweden who is in the United States desires to secure agencies for the sale of automobiles and accessories. Reference, 31729.

A commercial agency firm in Mesopotamia desires to secure from manufacturers the sole agency for a motor car suitable for that country. Reference, 31741.

Combine Admissions To St. Louis Exhibits

ST. LOUIS, Jan. 16—Two motor car shows at the same time for one admission. This is the program of the St. Louis Automobile Manufacturers and Dealers' Association for the week of Feb. 16-21, as decided upon by the show committee of the association at a meeting last Friday.

A passenger car and equipment show will be held at the old Southern Hotel Building, Broadway and Walnut Street. The Coliseum at Jefferson and Washington Avenues will be the scene of the truck show, which will comprise every type of commercial car.

Admission tickets will be sold for 50 cents at either show. The tickets will carry a coupon admitting the bearer to the other show at any time. The distance between the two shows is several miles.

TO BUILD TRUCK CABS

GRAND RAPIDS, MICH., Jan. 16—The Brummeler-Ruggles Metal Products Co., capitalized at \$50,000, will erect a factory at Ionia Avenue and Stevens Street, for the manufacture of all metal cabs for motor trucks. Ground has been broken for the plant and operations will start in the spring. A. J. Brummeler, R. J. Brummeler and James Vander Waale have long been identified with the metal trades in Grand Rapids, and A. B. Ruggles resigned recently as vice-president of the Hamilton Motors Co.

86 MAKES AT K. C. SHOW

KANSAS CITY, Jan. 16—The Kansas City show, Jan. 31 to Feb. 6, in the Overland Building, is to be the greatest Kansas City has known. Three floors of the building will be devoted to the show, the first for motor trucks, the second, passenger cars and equipment, and the third, passenger cars exclusively. It is announced that 86 makes of cars will be exhibited. Nine states will be represented in the territory covered by the show.

Canada Investigates Alcohol for Fuel

May Supplant Gasoline for Motors if Costs Warrant Substitution

TORONTO, Jan. 16—Canadians are soon to run their cars on denatured alcohol instead of gasoline. That is the prediction of Professor A. B. Macallum the administrative chairman of the Honorary Advisory Council for Scientific and Industrial Research, in a report to Sir George Forster, chairman of the sub-committee of the Privy Council for Scientific and Industrial Research.

Dr. Macallum goes thoroughly into the alcohol question and shows that alcohol is much more expensive in Canada than in the United States. He points out how conditions here have limited its use, and then makes this statement:

"A survey of all the facts concerning gasoline and alcohol as motor fuels makes it almost a certainty that alcohol, denatured for the purpose, will be the motor fuel of the near future. It can be made from materials now considered waste and yet inexhaustible, while the supply of gasoline, unless made synthetically, will become exhausted. As the supply approaches exhaustion the price will rise and alcohol will then, if cheap, take its place as fuel.

"In Canada the consumption of alcohol is meagre. It was only 252,000 proof gallons in 1917. If it had been in proportion to the population as compared with the United States the amount would have been in the neighborhood of 5,000,000 proof gallons.

Present Supply Costly

"One of the reasons for this limited consumption is the cost; a very important contributory factor to which is the conditions under which the denaturation is carried out by the Department of Inland Revenue. All the alcohol so used has to be shipped to Ottawa from the distillery where it is produced, and after it is denatured it is shipped to the customers.

"Another factor is the present high price of alcohol, due to the bonding system, which requires that alcohol shall be kept in bonded warehouses for two years before being sold to the trade. Much of the present supply in Canada has been in bond for considerably more than two years.

"The wholesale price of alcohol of 95 per cent strength at the time of this writing is \$7.43 per gallon, which includes the excise duty of \$3.96. The distiller then receives about \$3.47 per gallon, while the wholesale price of ethyl alcohol of 95 per cent strength in the United States is from 50 to 55 cents per wine gallon."

Dr. Macallum points out that Canada's pulp mills, by utilizing the now wasted sulphite liquor, could supply 5,000,000 gallons annually, enough to supply Canada for 20 years, and the cost would be about 35 cents a gallon.

Arrange Program of N. A. D. A. Convention

Eastern and Western Selling
Methods Will Be Outlined
by Section Leaders

ST. LOUIS, Jan. 16—Eastern methods of retailing automobiles will be compared with Western at the third annual convention of the National Automobile Dealers' Association at Chicago, Jan. 26-27, according to an announcement by Harry G. Mook, secretary and general manager of the association, who has completed the program of the event.

The Eastern method will be presented by H. B. Harper of the Overland-Harper Co., Philadelphia, and the Western by Claude Herring of the Herring Motor Car Co. of Des Moines. Theirs will be the only two formal addresses of the convention. Herring's address is entitled "The Retail Automobile Dealer's Establishment," and Harper's, "Selling the Passenger Car."

Both addresses will be made Monday afternoon, Jan. 26. Monday morning will be devoted to reports and business. Monday night is set aside for the dealers' second annual trade frolic, for which E. E. Peaker, of Kansas City, has been named toastmaster. A forum will be held on Tuesday morning, at which session leaders will be allowed ten minutes each to present subjects. Discussion of subjects will be held to twenty minutes, no speaker to be allowed more than five minutes. It is hoped in this way to get the views of a half hundred men on some particular phase of the industry.

Subjects and Leaders

The forum subjects and leaders are "Why the Townsend Bill," Pyke Johnson, N. A. D. A. Washington highway representative; "The Service Manager's Job," P. E. Chamberlain, Denver leader; "What We Must Do for the Trade Schools," F. W. A. Vesper, St. Louis leader; "The 1920 Way of Selling Motor Trucks," N. H. Cartinhour, Indianapolis leader; "The Future of Successful Automobile Merchandising," J. O. Munn, Toledo, Ohio, leader.

Tuesday afternoon will be devoted to consideration of changes in the charter which will give the association ten directors instead of nine, and to provide for the election of three instead of one.

Change Designation of Army and Navy Air Board

WASHINGTON, Jan. 16—The Joint Army and Navy Board of Aeronautics which comprises aeronautics officials of the War and Navy Departments, has changed its name and will hereafter be known as the Aeronautical Board.

The present members of the board are Major General Chas. T. Menoher, Director of Air Service, chairman; Lieut.-Col. George A. Nugent, C. A. C., U. S. A.; Lieut.-Col. Byron Q. Jones, A. S., U. S. A.; Capt. Thomas T. Crovent, U. S. N.,

Director of Naval Aviation; Capt. Lyman A. Cotten, U. S. N.; Commander J. C. Hunsacker, U. S. N.; Commander Warren G. Child, U. S. N., and Lieut.-Col. A. R. Christie, A. S., U. S. A., working committee, and Capt. A. J. Clayton, A. S., U. S. A., secretary.

The duties of the board are to consider and make recommendations for prevention of duplication, to secure co-ordination in the plans for new projects for construction of aircraft, for experimental stations, coastal air stations and for stations to be used jointly by the Army and Navy, as well as questions relating to the development of new types of aircraft and weapons used on aircraft, and other important questions relating to Government activities.

Ask Investigation of River Rouge Deepening

WASHINGTON, Jan. 16—That the contemplated improvement of the River Rouge in Michigan is solely for the benefit of Henry Ford and the Ford Motor Co., and that there was an "unlawful use of influence" in connection with this matter, is the tenor of a resolution introduced in the Senate yesterday by Senator Sherman of Illinois. The resolution calls upon the Senate to conduct an investigation.

Will Make Monarch Tractors in Jersey

CHICAGO, Jan. 16—General Tractors, Inc., maker of the Monarch Creeper Tractor line, expects to reach production of ten tractors a day within a short time at the new Paulsboro, N. J., plant, recently opened. The Watertown plant is devoted exclusively to the building of the largest size machine.

The New Jersey plant is exceptionally large, and was used during the war for the manufacture of munitions.

NEW APPERSON PRICES

NEW YORK, Jan. 16—New prices on Apperson cars went into effect to-day. The Apperson Anniversary, in 7-passenger and 4-passenger tourster, will list at \$4,250, and the Standard car, built in 7-passenger touring, 4-passenger sportster, or 2-passenger ace body, will sell at \$3,250. In the enclosed types the Standard model will list at \$4,500. All quotations are based on Kokomo, Ind., loading, and are subject to war tax.

PLAN JAPANESE ROADS

WASHINGTON, Jan. 16—Due to the extremely narrow roads and lack of sidewalks, automobiling in Japan is very difficult, as every one walks in the middle of the road, states a recent Commerce Report. Prominent business men have formed a \$5,000,000 corporation, which will accept contracts to build and repair roads of any type of material. The new project includes widening of the roads, which will doubtless open a market for automobiles.

Use Parachute Safely From Plane in Flight

WASHINGTON, Jan. 16—The Air Service Engineering Laboratory, Dayton, Ohio, recently demonstrated the successful use of parachutes as a means of safe exit from an airplane in full flight, which will eliminate many dangers which have been a bugaboo to flyers.

The parachute drop was made from a DH-9 A plane, Liberty motored, flying over 100 miles per hour at an altitude of 400 ft.

The parachute with a 200 lb. loading opened in 1½ sec. and reached the ground in 20 sec. with its living load, with no oscillations whatever.

From time to time it has been demonstrated that successful drops could be made at high altitude, but at an altitude of only 400 ft., with a high-powered plane such as a DH-9 A it is considered remarkable.

The parachute used was a reconstructed Martin, flat topped, with a spread of 27 ft. when fully opened.

Finland Organizes First Automobile Co.

WASHINGTON, Jan. 16—Finland's first automobile and aircraft factory has been organized, under the name of Auto-Lento, with a minimum capital of 5,000,000 marks and the maximum 10,000,000 marks, according to a report from Consul Buhrman. The factory is under the direction of an engineer who has had 15 years' experience in the American industry. It is planned to produce a complete standard car and motor trucks of 1½ to 2 tons' capacity, adapted to Finnish needs. The machines will be ready for delivery in the summer of 1920.

Aircraft production will not be undertaken for the present.

Plan New Technical School for Detroit

DETROIT, Jan. 16—An automotive technical school to cover 15 acres and to cost \$1,500,000, will be established in Detroit by the Michigan State Auto School. The institution, with a capacity of 5000 students, will be on Grand River Avenue. Separate buildings will be devoted to automobile and motor mechanics, welding and tire repairing, according to Arthur G. Zeller, president of the school.

The new school will have two dormitories, each containing 600 rooms, a gymnasium, mess hall, administration building, garage, repair shop, power plant, and other buildings for motor block tests and for the tractor department. It will be one of the largest technical universities in the world, and the plans provide for enlarging the scope of the institution to include instruction in radio telegraphy, airplane and tractor construction, rubber and steel work and allied subjects.

New Zealand to Take Many American Cars

NEW YORK, Jan. 21—The war made New Zealand an active market for American cars, according to William E. Hyslop of the Tourist Motor Company, Ltd., of Hastings & Napier, New Zealand, who came here to attend the New York Automobile Show. Hyslop, who is vice-president of the Automobile Trade Association of New Zealand, says that American automobiles, which were looked upon rather dubiously before the war, now are in first demand in the island territory, and the prospects are that several thousand will be sold during the present year.

With a population of 1,000,000, New Zealand has a motor vehicle in operation for every ten or twelve inhabitants, Hyslop says. When the war prevented importation of British, French and other European cars, buyers necessarily turned to American makes, and finding them thoroughly up to representation have continued to demand them in ever increasing numbers. Ford cars are at the head of the list, and Studebakers and Dodges also are popular, together with several other medium priced types of American cars. The demand for American manufactured vehicles is sustained through the fact that they pay only a 20 per cent import duty as compared with 10 per cent upon British cars. Road building is in progress, mostly of the Macadam type, and the greater part of the two islands making up the province is passable for motor cars.

Hyslop states that the New Zealand Automobile Trade Association has 400 members, comprising every one of the bona-fide garage owners handling both sales and service. Hyslop for a number of years has handled the Studebaker, and during the New York show he contracted for the H. C. S.

Swiss Organize for Aviation Development

WASHINGTON, Jan. 20—Although the commercial use of airplanes in Switzerland is still in its infancy, many manufacturers are organizing and planning for extensive trade, according to reports received by the Bureau of Foreign and Domestic Commerce.

A school has been established known as the Ecole "Aero" Lausanne, where pilots will be trained with "Aero" made airplanes, which are double-deckers with double steering gear.

Another concern has been established under the name of "Aero" Luftbildverlagsanstalt, which will devote itself primarily to aerial photography and which is using German double-deck planes with a capacity for a pilot and two passengers.

An aerial passenger concern has been established in Geneva under the name of Avion Tourisme, which is making regular flights with a hydroplane equipped with two 200 hp. Isotta-Franchini engines.

The Luftverkehrsgesellschaft is a company newly formed to use Savoia and

Dornier hydroplanes manufactured at the Zeppelin works for passenger flights over the Swiss lakes and high Alps.

The chief interest in Switzerland, according to the report, is in hydroplanes capable of carrying two to four passengers, and able to start and land within short distances, due to the mountainous surface of the country.

American Competition Closes Swedish Plant

WASHINGTON, Jan. 20—That a Swedish tractor factory in Halmstad, Sweden, has been forced to stop production because of the strong competition by American manufacturers of tractors is reported here by the American Consul at Malmo, Sweden. The low foreign exchanges have also been a factor. American tractors are selling in the Scandinavian market for \$2144, while Swedish tractors can not be manufactured to sell under \$4288.

PLAN GREAT COAST SHOW

SAN FRANCISCO, Jan. 20—The Motor Car Dealers' Association of San Francisco is planning to make its fourth annual Pacific Coast show, scheduled for the week of Feb. 21, one of the three largest of the year. Space has already been asked by 54 makes of passenger cars, 55 makes of trucks, tractors and trailers and 60 equipment exhibitors. The show will be in the Exposition Auditorium and will occupy 105,000 sq. ft. of exhibition space.

NAPIERS PAY 10 PER CENT

LONDON, Dec. 31 (*Special Correspondence*)—D. Napier & Son, Ltd., manufacturer of Napier motors, has declared a 10 per cent dividend, less income tax, on ordinary shares to holders registered on Dec. 13, 1919.

Girl Slated for Removal Is Report

Fight for Control of Standard Parts Said to Be Ready to Break

CLEVELAND, Jan. 21—Developments foreshadowing the elimination of Christian Girl as president of the Standard Parts Co. came to the surface to-day. At Girl's office it was admitted that Cleveland banking interests who hold Standard Parts paper are crowding the company, and threaten to call loans.

Rumors that a re-organization of the company was about to occur have been heard in New York and Cleveland. It was said that Girl's retention of a number of men, closely associated with him in the organization, who were said to be incompetent, was the reason for the proposed action on the part of the bankers. The alleged lack of progress in the development of the company, and the slowness of procedure with regard to expansions projected also were laid to Girl.

Prominent banking influences in New York and Detroit, who are said to regard the developments as a fight for control, are understood to have assured Girl that in the event of success on the part of the influences seeking the property, they will get behind him and finance any proposition he may undertake independently.

Standard Parts is regarded as one of the big automotive properties, and under the administration of Girl the property has developed. The annual report indicated that it was proceeding successfully and apparently had the brightest possible outlook. It was admitted at Girl's office that the company had made no money within the last year.

Automobile Engine Doing Border Duty



With a Studebaker engine for motive power, clay is hauled to the brick yards at Cement Plant, Tex., on this miniature railroad. Extensive and expensive equipment is not in favor along the border owing to depredations. While awaiting restraining influences, the automobile engine has been drafted for service and is giving it.

France and Italy To Race Cars Here

Ten to Fifteen Entries Expected
at Indianapolis Event—
Sunbeam Out

(Special Correspondence)

PARIS, Jan. 21—From 10 to 15 European 183 cu. in. racing cars may be expected to start in the next Indianapolis 500 mile race. No official entries have been received and manufacturers are maintaining secrecy regarding their plans, but it is known that cars are in a very advanced condition at the Fiat, Peugeot, and Ballot factories. Each of these firms may be expected to send a complete team of three cars.

In addition to this two French firms who do not wish their names to be made public at this time have 183 cu. in. cars in hand. The F. A. S. T. Co. of Turin, Italy, is endeavoring to get ready in time, and Bugatti holds out hope of two or three cars. One Belgian firm is also building and hopes to be ready in time. Ten of these cars will certainly materialize. If all of the plans should carry through successfully, it would give a total of 20 European racing cars, thus constituting a record.

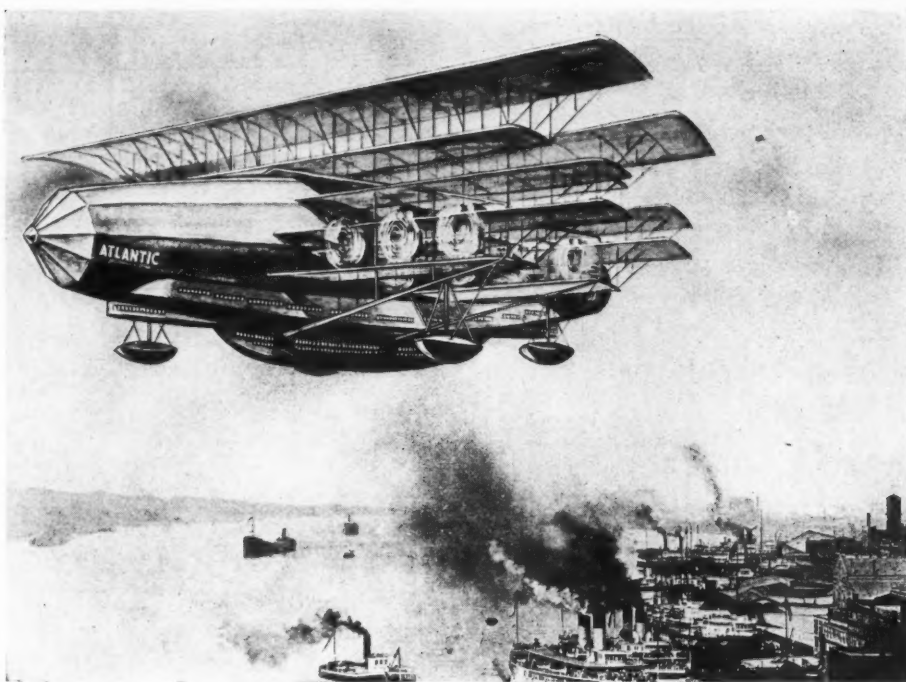
Sunbeam has decided not to race at Indianapolis. The English company, however, is now preparing a special 400 hp. racing machine which will make its first appearance at Brooklands during the Easter meeting, when it will go after several old records, and will later be run on the beach at Fanoe Island, Denmark, with the object of bettering the times set up by De Palma on the Packard. This Sunbeam car carries a special aviation engine.

As last year, Ballot is building 8-cylinder cars for Indianapolis. They will naturally be smaller than those seen on the track in 1919, for their cylindrical capacity has been kept down to fit the rules. These cars have been designed by Engineer Henry, who before the war was responsible for all the Peugeot racing productions. There is every likelihood that one of the Ballot cars will be given to Ralph De Palma. The other drivers have not been selected, but Thomas, doubtless, will be a member of the team.

Peugeot has secured the services of André Boillot and Jules Goux, but there seems to be a doubt whether the latter will come to America. Goux has started in business as Peugeot dealer with show-rooms in the Champs-Élysées, Paris, and according to reports he intends to marry and quit the racing game. There are numerous candidates for the vacant positions on the Peugeot team.

Fiat already has secured the services of Louis Wagner on its racing team. The second man will be Minoia, and the third choice seems to lie between Moriondo and Bordino, both of them Italians and experienced race drivers.

There will be no 183 cu. in. race in France this year, for the majority of the manufacturers have signed against rac-



"Across the Atlantic Ocean Gigantic"

Or across any ocean, for that matter, is the dream of a St. Louis engineer, in the 3000-passenger combination dirigible and airplane he has designed. Its ten tiers of wings have a span of nearly a half mile and an area of about five acres. Passages in 28 to 30 hours are calculated at a speed of 120 miles an hour.

ing. It has been decided, however, that a big race will be held in 1921, and already the Lyons district has put in a claim for the race to be held on the old 1914 Grand Prix course. This course will be adopted unless Strasburg asks for the race, in which case the Lyons club will withdraw in order to allow the race to be held in the reconquered provinces.

Italy will stage a race for 183 cu. in. cars, in the neighborhood of Brescia, for the month of September. This will be a road race over a very fast course, and looks likely to unite all the leading Italian firms and not a few from France.

New Pack Parachute Successful in Test

WASHINGTON, Jan. 20—Two successful parachute jumps with a new pack type of parachute have been made by the Engineering Division of the Air Service at Dayton, Ohio. Descents were made at an altitude of 2000 ft. from a Martin Bomber airplane. Considerable interest has been aroused in connection with the tests and ten non-commissioned officers are being instructed in the use of the parachutes and will later be sent to the various fields in this country to act as instructors.

DISTRIBUTERS CHANGE

MADISON, WIS., Jan. 19—The Fox Motor Sales Co., Madison, Wis., incorporated with \$25,000 capital, will succeed to the business of the Motor Sales Co., 123 East Main Street, Madison. It has

been appointed distributor of the Lexington in western Wisconsin and eastern Minnesota, and of the Hupmobile in six construction of seven main trunk highways, Paul F. Kentzler and Robert L. Pfister are the incorporators.

Louisiana at Work on Seven Main Highways

BATON ROUGE, LA., Jan. 21—The state of Louisiana, through its highway department, is at work to-day on the construction of seven main trunk highways which cross the state, and all of which not only connect with the various parish roads of the state but with the great transcontinental highways, north and south and east and west through the state.

These seven highways have a length within the state of 1375 miles, of which 547 miles have been completed; 344 are now under construction; 63 miles advertised for bids; 300 miles surveyed and platted, and 60 miles being surveyed. There are only 61 miles of which nothing has been done.

The main trunk lines through the state are the Spanish Trail, the Jackson Highway, the Jefferson Highway, the Dixie-Overland Highway, the Pelican Highway, the Ozark Cutoff, and the Mississippi highway. The Spanish trail is the highway from Jacksonville, Fla., to San Diego, Cal., the Jackson Highway the route from Buffalo to New Orleans, and the Jefferson Highway, from New Orleans to Winnipeg, Manitoba.

Says U. S. Must Adopt Commercial Aviation

WASHINGTON, Jan. 22—Commercial aviation is practically here and the United States must prepare to meet it, according to a report received by the Air Service from Col. William C. Hensley, who is studying German dirigibles in operation.

"Airships are now possible in any kind or condition of weather," Colonel Hensley writes. "No weather conditions, except a strong-cross hangar wind, prevent the Bodensee, the commercial air liner built since the armistice by the Zeppelin Airship Corp. at Friedrichshafen on Lake Constance, from making its daily flight (390 miles) to Staaken, 13 miles from Berlin.

"Because she flies between Berlin and the natural outlet to Switzerland the accommodations are at a premium. Bookings have been made four weeks in advance at 475 marks.

"The design of the Bodensee is the latest in airships, so far advanced over anything I have seen that one is led to express the opinion that in airship construction (and operation as well) all other countries are mere 'babes in the woods' compared to the Germans.

"Our airship construction and operation should be patterned after the most efficient system. There is no doubt in my mind that the system lies in Germany.

"Commercial air navigation is coming and we must meet the issue very soon. Let us be prepared to choose our course so that we shall make as few mistakes as possible. The building up of the present small commercial enterprise in Germany has meant numerous heartbreaking experiences.

"Millions of marks have been lost in the beginning, and lives of members of crews have been lost, but let it be said, to the eternal credit of the man with the fixed idea and his subordinates, that not a single passenger carried on a Zeppelin airship has been injured or killed—and to date the total carried has reached 140,000.

"America is by nature the chosen spot of all the world for commercial airship work with her great expanse of territory within, with her far-flung territories and insular possessions, with her commercial possibilities in Central and South America, with centers of population disposed so as to require more rapid transport than yet in operation, with her push and energy that bid for supremacy in all things good, with her supply of helium gas unequaled in all the world, should bid strong for that which is, unquestionably, her way in the path of progress."

Ford Co. Builds New Home in New Orleans

NEW ORLEANS, Jan. 21.—The Ford Motor Car Co., through H. K. Monroe, its local manager, has purchased a square in the uptown industrial section and has begun the erection of a building to handle its wholesale business, and to replace the building now used on Canal Street in

the downtown section. The five retail selling agencies for Fords in New Orleans will not be disturbed.

Fordson tractors and parts and equipment for tractors, trucks and passenger cars also will be wholesaled in the new building. The center of distribution for the tractors is now Lake Charles, La., but the wholesale department will be brought to New Orleans as soon as the building is completed.

Miller Rubber Sales \$26,000,000 in 1919

YOUNGSTOWN, O., Jan. 21.—Sales of the Miller Rubber Co. in 1919 were \$26,000,000, a gain of 60 per cent over 1918, in which year sales aggregated \$16,000,000. In 1917, sales totalled \$11,000,000.

Directors of the company have voted to increase the capital stock from \$20,500,000 to \$60,000,000, consisting of \$20,000,000 of common and \$40,000,000 of 8 per cent cumulative preferred stock. Stockholders will meet Feb. 12 to vote on the proposition. The company contemplates calling for redemption on Feb. 20 its outstanding second preferred stock amounting to \$2,000,000 at 105 and accrued dividends, and its first preferred issue of \$2,846,900 on March 20 at 115 and dividends.

TO DISTRIBUTE STEVENS

MILWAUKEE, Jan. 19.—The Magnetic Motors Corp., 430 Jefferson Street, Milwaukee, distributor of the Owen and the Rauch & Lang electric in Wisconsin and Upper Michigan, has been appointed distributor in the same territory for the Stevens-Duryea.

Bassett President of Buick Motor Co.

Succeeds Chrysler, Who Resigned —Expansion Provides Daily Output of 750 Cars

DETROIT, Jan. 20—Buick Motor Co. directors, at the annual meeting yesterday, promoted Vice-President H. H. Bassett to the presidency, to succeed Walter P. Chrysler, who has joined the Willys organization, and announced plans for buildings and extensions to cost \$10,500,000.

The meeting was held at the plant in Flint. The program outlined includes nine new buildings in Flint and extensions to three others with new machinery and equipment, the total cost of which is estimated at \$7,500,000.

An output of 750 cars a day is planned, and construction work already has been started on the new buildings. An assembling plant, to cost \$3,000,000, is to be erected at St. Louis. In addition to assembling 300 cars a day, equipment will be installed for turning out 200 finished automobile bodies every day.

DEVELOP PLANE CRANK

WASHINGTON, Jan. 16.—A portable engine cranker has been developed at McCook Field, Dayton, for use on all airplanes equipped with right-hand engines fitted with standard heads not mounting spinners. The cranker develops a starting torque 50 per cent greater than that needed to turn over a cold Liberty 12.

Just a Corner of the Paris Aircraft Show



New records for number of exhibits and splendor of appointments were established at the Paris Aircraft Show recently held. In the corner pictured above may be seen practically all of the types made famous by their performances in the defense of the city in which they were being shown.

Outline Plans for British Air Routes

Committee Would Have Govern- ment Develop Fields and Dromes for Aviators

WASHINGTON, Jan. 20—The report of the British Advisory Committee on Civil Aviation, on the establishment of Imperial Air Routes, has just been received in this country. It deals only with the use of heavier-than-air machines, and the establishment of main trunk lines between the various portions of the British Empire, including Canada, Newfoundland, South Africa, India, Australia and New Zealand.

The report believes that it is not practical at the present time to recommend any large appropriations of public funds for investment in what is now "an entirely novel business." It believes that the proper route for initial action is between England and India and ultimately from India to Australia, with second choice a route from England to South Africa, which between England and Egypt, would be over the same route as is contemplated to India. The section between Egypt and Karachi should be established by England, states the report, while the remainder of the route should be initiated and encouraged by the Indian government.

The committee decided against the use of the Royal Air Force squadron for civil purposes, both because there are weighty objections by the Service and other private enterprises. It considered three possible methods of organizing the undertaking, including operation by the State itself, the formation of a chartered company combining State and private capital, and third, private enterprise aided by the State.

It opposed the suggestion of operation by the State itself, because the work calls for initiative and development that Government departments do not possess. It decided against the formation of a chartered company combining State and private enterprise because the concentration of all British aerial effort in a single organization would have a narrowing tendency "likely to jeopardize success."

State Aid Recommended

The third method, that is, the use of private enterprise, with some State aid, including in the latter meteorological and wireless information, the establishment of terminal and intermediate airdromes and the construction of emergency landing fields, was considered most sound. The committee is in favor of this plan chiefly because it believes that when aerial transport becomes an assured success, it will be important that the ports should be owned and controlled by the State.

In order to encourage private enterprise, the committee is advertising the fact that the establishment of an air route will reduce the travel from England to India from nine days to five and

one-half days. It is recommended to the Post Office that it should draw up a form of tender for an air mail contract with private concerns. This contract will be put up to limited competition between firms of good standing. It will provide for alternative tenders for service of varying frequency per week, and will make clear any question as to what facilities the State will provide to assist the private companies.

The committee also suggests that a certain quantity of the aircraft engines and material which have been declared surplus by the Royal Air Force should be placed at the disposal of the Civil Aviation Department for distribution free in England and the colonies, and that prohibitory bans on civil aviation in England and India should be removed.

OLD TIMERS' CLUB

One of the interesting features which developed during the New York Show was the appearance of the Old Timers' Club, fathered by the Standard Parts Co. of Cleveland, Ohio. This company, which has associated with it some men who have been in the business for a great many years, conceived the idea of gathering the old timers into a more or less informal organization, wherefore the company prepared a number of buttons with different markings for 20, 15, 10 and five years in the industry. These buttons were distributed at the show and adorned the lapels of many men who are proud of the length of time they have served with the industry. The headquarters in New York were at the Commodore Hotel and it will hold court in Chicago at the Congress.

FORMS GARAGE COMPANY

RACINE, WIS., Jan. 20—The Central Garage & Supply Co. of this city has been organized by Ralph W. Davis, who resigned as chief engineer of the Mitchell Motors Co. to form the company. Arthur O. Engstrom, assistant chief engineer of Mitchell, also resigned to become a partner in the company with Davis.

ACQUIRES MORE SPACE

PHILADELPHIA, Jan. 20—The three-story concrete building at 671-3 North Broad Street has been purchased by Samuel R. Blocksom, of the S. R. Blocksom Motor Co., Stutz merchandiser. The Electric Storage Battery Co. is present occupant of the building.

PLANS FOREIGN SALES

NEW YORK, Jan. 21—Benjamin F. Baker, foreign representative of the Packard Motor Car Co., will sail for England early in February to investigate the British market with a view to establishing permanent sales offices in that country.

Introduce Army Air Bill for \$15,680,625

WASHINGTON, Jan. 18—Expenditure of \$15,680,625 from War Department surplus funds for airplanes and motors would be authorized by a bill introduced in the House yesterday by Chairman Kahn, of the Military Affairs Committee. The measure is designed to carry out the request made by Secretary Baker of Congress at the special session that sufficient appropriations be made to keep alive the war-created airplane industry.

Most of the money would be for bombing planes, the expenditures for these being \$5,625,000.

Secretary Baker, in asking Congress to authorize expenditure of \$15,680,625 for the purchase of airplanes and motors, wrote Chairman Kahn, of the Military Affairs Committee, that the proposed work would be allocated so as to foster the aviation industry.

Map Out Details of National Truck Tour

OMAHA, Jan. 21—Entry blanks, prospectus and tentative maps of the route for the First National Motor Truck Reliability Contest, promoted by the Bee Publishing Co. of Omaha, are being distributed generally to manufacturers and representatives. Indications point to the inclusion of every prominent truck manufacturer in the contest.

General plans for the contest have received the approval of leading makers. The route through the money belt of the West is considered the most fertile for truck sales in the country. Entries are to be limited to pneumatic tire equipment which has earned the further approval of prospective entrants, as this type is considered essential in the district to be traversed.

Georgia Dealers Put Good Roads Move Over

ATLANTA, GA., Jan. 21—W. R. Neel, Georgia State Highway Engineer, in a statement recently, gave the Georgia State Automobile Association principal credit for the \$9,988,249 worth of road construction that is assured for Georgia in 1920. The association is planning propaganda that will make for the permanent improvement of the 4500 miles of road in Georgia.

DISTRIBUTERS INCORPORATE

MONMOUTH, ILL., Jan. 20—The Maple City Garage, of this city, distributors of Republic and International trucks, Titan tractors and Jordan and Chevrolet cars, has been incorporated as the Maple City Motor Co., with a capital of \$40,000.

APPOINTS DISTRIBUTERS

OMAHA, NEB., Jan. 16—Douglass motor trucks will be handled in Louisiana by J. M. Allaba of Shreveport and in Arkansas by P. P. Shaw of Little Rock.

Horace E. Dodge to Head Dodge Interests

DETROIT, Jan. 19—Funeral services for John F. Dodge, president and treasurer of Dodge Brothers, were held Saturday. Thousands of automobile men paid final tribute to the late manufacturer, included among whom were Dodge employees. The Dodge plant was closed Saturday in respect to the deceased. Floral tributes included a piece from the National Chamber of Commerce, and pieces from numerous Dodge agencies about the country.

It was announced that the business will be continued as formerly, with Horace E. Dodge to succeed his brother at the head of the concern, as soon as he is sufficiently recovered. It is thought provisions for the continuance of the business are contained in John F. Dodge's will, the particulars of which will be announced in the time set by law. A meeting of Dodge directors will be held in the next few days to consider realignments.

Fordson Distributer Gets Des Moines Site

DES MOINES, Jan. 20—The big assembling plant at Des Moines, which was built two years ago by the Ford Motor Co., but which up to this time has not been put into service, will be completely occupied during the next few months. C. L. Herring, Fordson distributer in Iowa, South Dakota and Nebraska, returned this week from Detroit after a conference with Henry and Edsel Ford and made the announcement that the Ford Motor Co. planned to put the building to use during the present season. There had been a rumor going the rounds of Motor Row in Des Moines for some time that Herring was negotiating for the purchase of the building but he stated he only contemplated this course in the event the building was not used by the Ford Co.

Connecticut to Build Road With Federal Aid

HARTFORD, CONN., Jan. 21—The State Highway Department has called for bids for the construction of 32.2 miles of concrete road between Glastonbury and New London, the road to be 18 ft. wide. This stretch will be built this spring in conjunction with the Federal aid project and will when completed materially shorten the trip between Hartford and New London. It will be of value in long distance trucking, there being considerable between the two cities.

SELL ENGINEERING SERVICE

NEW YORK, Jan. 21—Service Engineering Co., 25 Church Street, has been incorporated under the laws of the State of New York with a capital stock of \$50,000, to render general engineering service and to specialize in the design of tools, jigs, fixtures and methods for

interchangeable manufacturing of motor cars, motor trucks, and other products made in quantities.

The officers of the new company are: Albert A. Dowd, president; Donald A. Baker, vice-president; Fred E. Rogers, treasurer, and Thomas P. Orchard, secretary. The company employs a force of about sixty men, and is prepared to give engineering service on short notice.

New Dort Prices in Effect February 15

FLINT, MICH., Jan. 19—Prices on Dort cars, effective Feb. 15, are announced by the factory as follows: Touring car and roadster, \$1,035; four-season sedan and coupe, \$1,665.

General Motors Earns \$84,000,000 in 1919

NEW YORK, Jan. 21.—According to information from a reliable authority, General Motors Corp. earnings (before taxes) for the first ten months of 1919 amounted to \$84,000,000. Total earnings for the year (before taxes) are estimated at \$96,000,000. This compares with earnings (before taxes) for 1918 of \$45,541,726. Earnings for the calendar year 1920 are estimated at \$145,000,000.

Gross assets employed in the business of the company at the present time are \$500,000,000. Gross sales for 1919 as estimated will show a total of \$700,000,000. This compares with \$326,044,755 for 1918. Gross sales for 1920 are estimated at \$1,000,000,000. The estimated gross sales of \$700,000,000 for 1919 are said to be equal to the average gross annual sales of the United States Steel Corp. for the five years previous to 1916.

GET GERMAN PLANES

WASHINGTON, Jan. 20—A varied collection of German airplanes has been received at the Wilbur Wright Air Service depot, Fairfield, Ohio, including Fokker, Pfalz, Hanover, Friedrichshafen, Gotha, AEG, LVG, Halberstadt, Albatross, Rumpler, Roland, Siemens-Schuckert and two sets of upper wings for the famous Junker C-1, all-metal-type airplane. The sheet surfaces of the wings for the Junker airplane are of corrugated iron and are very well internally braced with semi-tubular aluminum alloy. Group characteristics of these planes with their heavy, substantial, large bored, upright engines are easily distinguishable.

WASHINGTON DEALERS DINE

WASHINGTON, Jan. 20—The Washington Automotive Trade Association held its first annual banquet here last night, at which time addresses were made by A. G. Bachelder, chairman of the Executive Board of the American Automobile Association; Pyke Johnson, secretary of the highway committee of the National Automobile Chamber of Commerce, and others.

Friend Motors Corp. Will Build New Car

Olympian to Be Continued at Pontiac Pending Introduction of Friend Creation

NEW YORK, Jan. 21—With the difficulties of the Olympian Motors Co. deal ironed out after several months of negotiation which at one time threatened to develop into a legal tangle, Otis Friend has announced the organization of the Friend Motors Corp., which has taken over the Olympian factory at Pontiac.

Although it is understood that Friend intends to introduce a new car, embodying his personal ideals in construction, the announcement is made that the Friend organization will continue, for the present, the production of the Olympian model. No hint is given as to the type of the new Friend car, the name of which probably will be "Pontiac."

In heading his own manufacturing company, Friend comes into the realization of a life-time ambition. He has had a unique career as designer, engineer, production manager, sales executive and president. His introduction to the industry dates back to the days when he was a junior salesman in a Chicago sales-office. From Chicago he went to Milwaukee to become Mitchell distributor, and then through various executive positions with the Mitchell Motors Co. at Racine to the presidency of the company, which he relinquished when he became vice-president of United Motors. He entered the Durant organization when it was absorbed by General Motors.

Mississippi Starts Main Highway Routes

JACKSON, MISS., Jan. 21—Willingness of a majority of the counties of Mississippi to put real money into the construction of good roads augurs well for the \$25,000,000 bond issue which is to be asked of the present session of the state legislature for the building and maintenance of a state system of highways which shall be supervised by the state rather than the separate counties.

Lamar county has just sold \$295,000 in good road bonds at a premium, and \$100,000 of this will be spent on the Jackson Highway, which is to connect Buffalo, N. Y., with New Orleans, through Meridian and Jackson, Miss. To this \$100,000 will be added by the Federal government. Senatobia county is constructing \$500,000 worth of improved highways, including 12 miles of the Memphis-New Orleans road, for which government aid has been obtained.

NAMED DISTRIBUTER

PHILADELPHIA, Jan. 20—The Lansdale Motor Co., Inc., has been appointed distributor of Service trucks for eastern Pennsylvania and New Jersey. Eugene J. Logan, formerly with the Fairbanks Co., is president; Robert M. Hallowell, vice-president, and Joseph A. Willis, treasurer.

Implement Dealers Discuss Tractors

Sales Methods and Service Questions Considered at Annual Convention

KANSAS CITY, Jan. 20—The convention of the Western Retail Implement, Vehicle and Hardware Association was held in Kansas City, Jan. 13 to 15; the thirty-first convention of this association and the largest.

The discussions and the resolutions threw interesting lights on the position of the implement men in the tractor industry.

These dealers are selling implements and hardware—and nearly all of them, now, are handling tractors—in Oklahoma, Missouri and Kansas, three of the best tractor states in the Union. Conditions are generally good for tractor sales.

But many of the dealers have not been getting away with it.

The dealers are very generally agreed on three items:

1. The power farming equipment trade belongs to the implement dealer.
2. Successful power farming trade is based on service.
3. Successful power farming trade is unprofitable without a larger discount than 25 per cent on tractors, and 15 per cent on repairs.

The implement dealers are, generally, convinced that they must make aggressive effort after business if they hope to sell tractors; and that the service, in maintenance and in supplying of parts, must be given by the dealer himself in his own community.

Canada Appropriates \$20,000,000 for Roads

WASHINGTON, Jan. 20—An act has been passed by the Government of the Dominion of Canada appropriating \$20,000,000 to encourage highway construction in the different provinces. Each province is required to agree to a five-year program of construction and road maintenance. The appropriation will be available only for the construction of main and market roads. The Dominion will provide 40 per cent of the funds, the provinces furnishing the other 60 per cent. It is provided, however, that the cost to the Dominion will not include provincial overhead and administrative expenses or any engineering expenses incident to the projects prior to beginning actual construction.

PRESENTS "BLUE-SKY" BILL

WASHINGTON, Jan. 16—Senator Kenyon, of Iowa, yesterday introduced a drastic "blue-sky" bill, designed to protect against fraudulent stock transactions and sales of wildcat securities.

It provides that whenever an offering of an original security is made to the public the issuing company shall file with the postmaster and also with the Federal

Trade Commission in Washington a statement signed by its officers or promoters showing the purpose for which the corporation is organized; names of its officers or promoters, their residence, where such securities are held, what commission, if any, the officers, directors, agents, etc., are to receive, the latest balance sheet, purposes to which the proceeds of the sale of the new security are to be devoted, terms of the flotation in detail, etc.

The penalty for violation of the law is to be a fine of not less than \$5,000 or imprisonment for not more than five years, or both.

De Luxe Moto-Meter



NEW YORK, Jan. 10—A new model of the Boyce Moto-Meter, known as the De Luxe Model, was shown at the Grand Central Palace this week. The temperature tube is one-half inch in diameter, having a broad column of red liquid readable at a great distance. The case is silver plated. The size of the instrument is $3\frac{3}{8} \times 5\frac{1}{4}$ inches.

DISTRIBUTOR MOVES

PHILADELPHIA, Jan. 20—George Hugh Smith, Inc., distributor in this territory of Owen-Magnetic, Milburn and Raulang cars, and Biddle agent, has moved to 1835 Chestnut Street. The service station will remain at the former quarters.

SOUTHWEST NASH BUILDS

ST. LOUIS, Jan. 16—A new two-story fireproof building to cost \$150,000 will be erected by the Southwest Nash Motor Co., distributors of the Nash, at Garrison Avenue and Locust Street. A row of several brick houses have been razed to make way for the new building, and excavation work will start at once.

Jobbers Form Co. to Make Own Supplies

NEW YORK, Jan. 16—A new development in manufacturing and merchandising is incorporated in the plans of the Moto-Chemical Co., which proposes to make chemical products in the automotive field such as carbon cleaner, body polish and similar articles. The unusual part of the plan is that the stock in this company will be owned by approximately 2000 jobbers, in other words the jobber will become practically his own manufacturer in these particular lines.

The plan is the idea of A. Gale Thomson, formerly sales manager of the Joseph Dixon Crucible Co., who has made a study of sales and merchandising for 20 years. The amount which each jobber can subscribe to the stock of the company is fixed at \$2500, and all profits of the enterprise are returned to the stock holding jobbers. In addition to the regular dividend on the stock any surplus earnings will be returned to jobbers in proportion to the amount of business they have done with the company during the year. The control of the company will be vested in the stockholders and the corporation will operate pretty much as any other form of manufacturing corporation, the principal difference being that the buyers of the merchandise hold the stock.

Those associated with Thomson in this general enterprise include George H. Townsend, president of the Moto-meter Co., Darwin R. James, president of the American Chicle Co., G. N. Shaffer, president of the W. E. Pruden Hardware Co.; Lester W. Perrin, vice-president of Adrian Van Sinderen & Co., New York. Thomson will be vice-president and in charge of sales. The company at present is going through its organization stage and will not be ready for production for some little time, although it hopes to get into operation at as early a date as possible. In addition to shellacs, soaps, paints, polishes, restorers, dressings and similar compounds, a line of oils and greases will be developed later on.

CHARTER PARTS COMPANY

CLEVELAND, Jan. 19—The Perfection Parts Co. has been chartered, with a capital of \$100,000, to manufacture automobile parts and equipment. The incorporators are R. H. Reiter, Charles C. Benner, Don H. Harter, A. W. Walker and Velma Blout.

CYCLOMOBILE INCORPORATES

TOLEDO, OHIO, Jan. 19—The Cyclo-mobile Mfg. Co. has been incorporated, with a capital of \$600,000, to manufacture all kinds of motor vehicles, including passenger cars, motor trucks and motorcycles. The incorporators are Thomas Davies, John F. Parsons, Charles F. H. Hammel, William E. Jimelhoc and Isaac Mittenthal. Production will start early in the spring.

Airmail Threatened By Congress Action

Service Will Be Abandoned June 30, Unless Appropriations Are Granted

WASHINGTON, Jan. 16—The service on all airplane mail routes will cease on June 30, if the action taken in the House of Representatives yesterday is allowed to stand. The annual post office appropriation bill was passed without provisions for funds to continue the air mail service. Provisions for experiments with motor truck routes were also eliminated.

The proposed appropriation of \$850,000 for the air mail branch of postal activities was stricken out on a point of order raised by Representative Tincher of Kansas, and sustained by Representative Walsh of Massachusetts, presiding in committee of the whole.

Unless some way is found to restore the provision, the Post Office Department will be without funds for operation of the mail planes. Discussing this, Second Assistant Postmaster General Praeger, who has charge of air mail service, said:

"Unless the Senate restores this appropriation, we will be obliged to suspend all operation of mail planes on June 30. We will be able to and will continue the service up to that time in any event, because we have funds sufficient to finance it until then. After that, of course, we have no authority in law to maintain the service, unless Congress in the meantime should provide it by separate legislation."

Claims Service Unwarranted

The provision in the bill which would authorize the appropriation of \$850,000 and the continuance of the Air Mail Service after July 1, 1920, was eliminated after considerable debate, when Congressman Tincher claimed that operation of the service permanently was unwarranted by law. It is expected that the Senate will restore the provision.

The provision which would authorize the Postmaster General to extend the Air Mail Service to Alaska was the object of considerable objection from Congressmen who were more eager to have the service extended to their own states and consequently opposed the appropriation and provision. They asserted that the Post Office did not actually intend to extend the service to Alaska.

The debate revealed that it now costs 6 cents per ton-mile to carry mail by rail as compared with \$5.25 per ton-mile by airplane, but it is claimed by Post Office officials that this latter figure can be reduced to \$2.40 per ton-mile when the new airplanes carrying 500 lb. or more of mail are used.

Involves Air Development

It was pointed out by Congressman Longworth that the cost of transportation of mail by airplane is not the only question to be considered in making appropriations, but that it involves also development of aeronautics in the United States. Appropriations, he said, should

be regarded as being made for aeronautic development as much as for direct Air Mail Service. Longworth recalled the strenuous objections made by alleged economists to the appropriation of \$15,000 asked by Prof. Langley years ago, which resulted in the delay of aeronautic development in this country for many years.

Government Returns

Ford Atlanta Plant

ATLANTA, GA., Jan. 20—After operating the Ford motor plant in Atlanta, as a reclamation depot for the quarter-master corps during the entire period of the war and up to the present time, the War Department has officially returned the plant to the Ford company. More than \$1,000,000 worth of stock and auto parts were transferred to the factory from temporary location on Forsyth Street, and work of reassembling Ford cars will begin there in the near future. R. S. Abbot is the manager of the factory for the Ford company.

Chevrolet Body Plant

Sold to Commercial

ST. LOUIS, Jan. 19—The Commercial Auto Body Co., of which Hugh F. Cartwright is president, has bought "running" the automobile and truck body plant now operated by the Chevrolet Motor Co. The transfer, which includes all the machinery, becomes effective April 1, when the Chevrolet Motor Co. expects to be in its new plant. The plant has a capacity of 550 bodies a day. The deal is said to have involved more than \$200,000.

According to the plans the present Commercial Auto Body Co. plant is to be continued. The production of this plant was 4000 light delivery and truck bodies of various types, 5000 driver's cabs and 6000 truck windshields.

TO MAKE BATTERY CONTROL

NEW YORK, Jan. 17—The Rathbun Electric Co., Jamestown, N. Y., is preparing to manufacture the Reco battery control, which consists of a signal, a rheostat and other equipment to vary the charging rate of the generator to suit the condition of the battery. Plans are under way to begin manufacture soon, and it is expected that deliveries will start in May. The apparatus will sell for between \$15 and \$20.

LITNUM BUYS PROGRESS CO.

MENOMONIE, WIS., Jan. 19—The Litnum Bronze Co., Menomonie, Wis., has purchased the machinery, equipment and business of the Progress Mfg. Co., Erie, Pa., manufacturing die castings and die-casting machinery. The plant will be moved to Wisconsin. The Litnum company manufactures a new alloy bearing metal and finds it necessary to greatly enlarge its facilities to meet demands from the automotive industries.

N. A. C. C. Thwarts Trademark Thefts

Association Lawyers and State Department Certain Attempt Will Prove Failure

NEW YORK, Jan. 17—The prompt action taken by the National Automobile Chamber of Commerce, following the registration of a large number of American car trademarks in Portugal a few days ago, is believed to have assured the American makers adequate protection against such pirates.

In co-operation with the State Department the N. A. C. C. moved immediately for the protection of the American makers, and through a lawyer in Portugal was able to thwart the attempt to steal the foreign rights that a Portuguese named Carmo had applied for.

Al Reeves, manager of the chamber, said to-day that the lawyers of the association, in co-operation with the State Department, had the situation fairly in hand, and that assurance had been received that this latest attempt would be unsuccessful.

"In a way," said Mr. Reeves, "this action in Portugal has brought forcibly to the attention of American car manufacturers the necessity for proper protection of their products abroad. For five years the N. A. C. C. has had lecturers speak to the manufacturers on this very topic, and has pointed out that the situation was being neglected. The registration of trademarks abroad calls only for the expenditure of something like \$7 a year for each country, so there is no reason why every American maker should not assure himself the proper protection abroad."

Road Builders to

Meet in Louisville

NEW YORK, Jan. 17—The seventeenth annual convention of the American Road Builders' Association will be held in connection with the tenth annual good roads congress and the eleventh annual good roads show, at the Jefferson County Armory, Louisville, Ky., Feb. 9 to 13 inclusive. The armory has over 50,000 sq. ft. of space which will be devoted to exhibits. The convention will be held in the assembly hall on an upper floor.

An instructive feature will be exhibits of road machinery and materials. Every kind of appliance and device for labor saving and better production results will be shown.

Included in the program of the congress is a committee report on "What Part of the Total Cost of Highway Construction and Maintenance Should the Motor Vehicle Be Expected to Bear?"

SPARK PLUG CO. GROWS

CLEVELAND, Jan. 19—The capital of the Sharp Spark Plug Co. has been increased from \$150,000 to \$300,000 by papers recently filed with the secretary of state.

Truck Lines Grow As Rail Rates Rise

British Cities' Plans Will Cause Wide Demand for All Type Trucks

LONDON, Jan. 2 (Special Correspondence.)—The advance in the railway freight rates which had long been anticipated seems as high as was expected in the best informed quarters. In effect it ranges from 25 to 100 per cent, with the addition in many cases of a flat rate of 6 to 12 cents a ton. As might be expected the largest increase concerns lighter goods, a point of interest to caterers with alternative traffic vehicles.

Another item of similar interest is the advance of 60 per cent in the rates on carriages of every description, with an addition of 60 cents flat rate per vehicle. So far as the delivery of motor cars is concerned it has been the practice for some time to send them by road, so that probably pending a marked increase of output on the promised mass production lines, this new burden will fall on the higher priced cars, which are mostly sent from the factories as chassis to be finished by local body-builders.

Taking the matter broadly this increase of rail rates should stimulate light parcels motor traffic and develop a large demand for low tare and roomy box trucks mounted on air-tires. This class of truck is little seen here as yet, but the Goodyear Tire Co. is doing some fine educative work by way of creating interest in their giant air tires.

Manchester Shows the Way

The fact that there are about 30,000 Ford 1000 to 1200 lb. vans in use in Great Britain will give some idea of the scope and type of light truck required.

In the case of the heavier motor truck traffic there is a rapidly increasing volume of business. Manchester during the war led the way with a clearing house scheme, chiefly to get over the difficulty of the return load, and the Government adopted the idea and developed it at Sheffield, Birmingham and other centres. Since the war local Chambers of Commerce have fostered interest in the clearing house scheme. Notably is this the case at Liverpool, where a clearing house scheme commenced early in November.

Since then several thousand tons of goods have been transported through its medium to all parts of the country, and, following the Liverpool example, similar clearing houses have been formed in many other towns. In this way co-operation is secured in the back-loading of vehicles. The Liverpool management claim that every lorry applying at the clearing house has been given a return load to its own town or a town en route, and that during the last month a return load has been arranged for every lorry taking an outward load from Liverpool. It is hoped that, as a result of a projected conference, motor haulage

clearing stations will be established in every important town in the kingdom, and by this means eliminate entirely the light running of motor-lorries.

American Makers' Opportunity

I think it worth while for American truck makers to give close attention to this development, both as regards a study of the sort of trucks best suited for the work, and in particular of *means and appliances to expedite loading and unloading*, box bodies, runner-platforms, quick-purchase windlasses and derricks, etc. Various forms of motor trucks are used, including tractor-trucks like the Knox, and four-drive trucks like the Jeffrey "Quad" and F.W.D., of which latter make there are some hundreds available.

Dealers Get Spaces for Detroit Exhibit

DETROIT, Jan. 21—More than 100 makes of passenger cars and trucks, with several models and styles of each, have been allotted space for the Detroit automobile show, Feb. 14 to 21. Practically every manufacturer of equipment for the automotive industry also will be represented, prominent among which will be all-weather and special tops being displayed for the first time.

The big Ford service building, five stories of which will be used for the display, furnishes an ideal location for the show, and President A. L. Zechendorf of the Detroit Automobile Dealers' Association predicts a record event from the standpoint of sales, dealer interest and exhibitors' effort. In the fact that the commercial car show will be held in conjunction with the passenger car exhibit the motor truck division is looked upon by many as the real commercial exhibit.

6,000 Lincoln Cars Promised First Year

NEW YORK, Jan. 22—Production of 6000 cars the first year and 15,000 the second is estimated by the Lincoln Motor Co. in connection with the sale of 160,000 shares of Class A stock through a syndicate headed by Kissel, Kinnicut & Co. and Cassatt & Co. Net profits during the first year of \$2,000,000 are predicted.

The successful distribution of the first year's output is assured, according to the company's officials, by the demands for territory from highly desirable applicants. Delivery of finished cars is set for April.

Henry M. and Wilfred C. Leland, president and vice-president respectively, control the Lincoln Motor Co. through ownership of a majority of the Class B shares.

The proposed new financing is to provide additional working capital for the production of the new Lincoln car and slight extensions to present facilities.

COLUMBIA ADDS TO STOCK

COLUMBIANA, OHIO, Jan. 19—Papers have been issued increasing the authorized issue of preferred stock of the Columbia Tire & Rubber Co. from \$300,000 to \$800,000 and at the same time authority was given to increase the issue of the common stock of the company from \$500,000 to \$1,200,000.

JAMBOR INCORPORATES

MILWAUKEE, Jan. 19—The Jambor Tool & Stamping Co., Milwaukee, has been incorporated, with a capital stock of \$100,000, to take over the business of the Jambor Mfg. Co., 911 Center Street, Milwaukee. J. E. Jambor is president and general manager.

They Call It Their "Little Red Bug"



But, even so, it takes them to a great many places, even duck hunting, and, moreover, the picture evidences that it knows where ducks are. In this instance it took them from Boston to Horse Neck Beach, Westport, Mass., and brought them back again the same day.

Financial News

Barley Motor Car Co. has been reorganized under Michigan laws as successor to the original New York corporation. President A. C. Barley announced that holders of original no par value common will receive for each share ten shares of the new issue, and the preferred is reissued share for share. The company plans a 5000 output in 1920.

Cleveland Automobile Co. has declared an initial dividend of \$6 a share on the company's preferred stock, payable Jan. 31 to stock of record Jan. 20. This payment clears up the back dividend of the 8 per cent preferred which has been accumulating since March, 1919. It is the plan of the company to increase its authorized common stock from 14,000 shares of no par value to 300,000 shares of no par. It is planned to issue 266,000 new shares to present holders, which would give them 20 shares for each share now held and make the total outstanding common issue 280,000 shares. A stockholders' meeting has been called for Jan. 22 to vote on the proposed issue.

Advance-Rumely Co. is expected to show earnings of \$8 a share on its common stock in its annual report soon to be issued. The company is planning to enter the motor truck field in 1920.

Hupp Motor Car Corp. has declared initial quarterly dividends of 2½ per cent on the common stock, payable Feb. 1 to stock of record Jan. 20.

United States Rubber Co. will pay a 12½ per cent dividend on its common stock on Feb. 19, to stock of record Feb. 5. The stock dividend will aggregate \$9,000,000. Earnings for 1919 have been estimated at over \$20,000,000, or \$28 a share on common, compared with \$16,072,041, or \$30.80 a share in 1918. Final surplus in 1919 will approximate \$14,300,000, compared with \$11,090,540 in 1918, and \$10,358,515 in 1917.

The Stewart Warner Speedometer Corp. will pay a quarterly dividend of \$1 per share on Feb. 15 to stock of record Jan. 30. This is at the rate of 16 per cent a year, as compared with 12 per cent on the old stock.

Nebraska Tire & Rubber Co. stock has been voted increased to \$200,000 preferred and \$300,000 common at the annual meeting of directors.

Economy Motor Car Co. has declared an 8 per cent dividend.

Cleveland Rubber Mold Foundry & Machine Co. has increased its capital stock from \$1,000,000 to \$2,000,000.

Harroun Motors Corp. will issue \$2,500,000 in preferred stock to refinance the company. The name of the company will not be changed to Wayne Motors Co., by vote of stockholders.

J. I. Case Threshing Machine Co. has declared a 10 per cent dividend on its common stock. In January, 1919, the company paid a 7 per cent dividend in Liberty bonds.

India Tire & Rubber Co. is to increase its capital stock from \$1,500,000 to \$5,000,000. Part of this is to be set aside for purchase by employees.

International Motor Truck Co. announces net profits of \$2,440,403 after Federal taxes, for the 11 months ended Nov. 30, 1919. This compares with net profits of \$1,245,771 for the year ended Dec. 31, 1918.

Ohio Body & Blower Co., in a balance sheet dated Sept. 30, 1919, shows a surplus of \$1,941,026.

Portage Rubber Co. has increased its capital stock an additional \$1,000,000 for expansion purposes.

Standard Motor Construction Co. has declared a quarterly dividend of 2½ per cent on the capital stock, payable Feb. 2 to holders of record Jan. 5.

Peerless Truck & Motor Corp. has declared a ½ per cent extra dividend and a regular quarterly dividend of 1½ per cent, payable April 1 to stock recorded that date. This is the second dividend paid by the company and is the same as the initial disbursement.

PLAN GLASS FACTORY

CHARLESTON, W. VA., Jan. 16—The Libbey-Owens Sheet Glass Co. plans the building of an additional glass manufacturing plant here that will cost \$2,000,000.

CAPITAL INCREASED

CINCINNATI, Jan. 19—The capitalization of the United States Motor Truck Co. was increased from \$1,000,000 to \$2,500,000 at a stockholders' meeting held here Jan. 14. The entire new issue was taken by the present stockholders. The company was taken over by the present managers in 1914 and capitalized for \$300,000. In 1917 it was raised to \$1,000,000.

FIRM TITLE CHANGED

CHICAGO, Jan. 19—The firm name of the Ross-Wortham Co., manufacturers of the R-W Parrott water-type air cleaner, has been changed to the R-W Co., a partnership composed of E. S. Wortham, Thomas S. Noyes and K. K. Wyatt. The change is made because George H. Ross has sold his interest in the business to the new associates. Offices will be maintained in the McCormick Building.

GETS NEW TERRITORY

FOND DU LAC, WIS., Jan. 19—The Dallman & Cooper Supply Co., Fond du Lac, Wis., distributor of Eagle tractors and other power farm machinery, has been granted the Minnesota territory and is opening a branch house at 107-109 Third Avenue, Minneapolis, in charge of Arthur F. Dallman. The company operates branch houses at Grand Rapids, Mich., and Shortsville, N. Y.

Find Large Supply Of Aircraft Wood

Timber Lands Rich in Spruce, Mahogany, Birch for Plane Building

WASHINGTON, Jan. 19—A history and report on the supplies and production of aircraft woods has been published by the National Advisory Committee for Aeronautics.

Spruce is declared to be the best wood for construction of aircraft because of its strength, light weight, toughness and flexibility, and Sitka spruce is declared most important because of its size, with consequent large proportion of clear lumber. There are large supplies of Sitka spruce available, although they are far from the centers of manufacture. Eastern spruce, which is also known as red spruce and white spruce, are ideal weights for the structural parts of aircraft and occur in extensive quantities in the eastern section of the United States. Douglas fir, a satisfactory substitute for spruce in making wing beams, longerons, struts and engine bearers, predominates in Oregon and Washington, where it is estimated 600,000,000,000 board feet are standing. Port Orford cedar, although equal or superior to spruce and a successful substitute for it, is limited by the supply, which is scattered throughout Oregon and California in small quantities. Other firs, including grand, silver, noble and white are used as satisfactory substitutes, but are also limited by available supplies.

White pine, which is found from Newfoundland to Lake Winnipeg and through the Lake States to the Appalachian Mountains, is a fairly satisfactory substitute for spruce in making wing beams, although it is somewhat softer and less stiff, but the remaining supply of virgin white pine is fast disappearing, and its many uses in other industries limit its availability for aircraft manufacture.

Mahogany, it is declared, is used satisfactorily in the manufacture of propellers, and it is estimated that approximately 20,000,000,000 board feet are available in Central America and Mexico. Black walnut, which is the best native wood for the manufacture of propellers, is also in large demand in the furniture, veneers, cabinet work and gun stocks industries, and the once large supply has been greatly reduced. Black cherry, which makes a satisfactory propeller wood, is also found in a very limited quantity, there being less than 500,000,000 feet in this country, and a large demand exists for cherry wood as a cabinet and fixture supply. Birch, which is satisfactorily used for propeller manufacture except where the requirements are exacting, occurs in large quantities in this country, and it is estimated that approximately 19,000,000,000 board feet are standing.

A copy of the report may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

DELAWARE INCORPORATIONS

WILMINGTON, DEL., Jan. 19—The following corporations have been chartered under the laws of Delaware:

Friend Motors Corp., with a capital of \$33,000,000, to manufacture motor vehicles. The incorporators are A. G. Thaanum, E. Kraychie and Harry G. Leise, all of New York.

Saginaw Motor Truck Corp., with a capital of \$10,500,000, to manufacture automobiles, engines, etc. The incorporators are Charles F. Burger, R. E. Johnson of Saginaw, Mich., and James H. Pierce of Bay City, Mich.

Oldsmobile Co. of Paterson, N. J., with a capital of \$150,000, to manufacture automobile tops, bodies, etc. The incorporators are Samuel B. Howard, George V. Reilly and Robert K. Thistle, all of New York.

Bales Service Stations, Inc., with a capital of \$1,000,000, to conduct service stations. The incorporators are M. L. Harty, M. C. Kelly and S. L. Mackey, all of Wilmington.

Blumberg Motor Mfg. Co. of Wilmington, with a capital of \$2,000,000, to manufacture automobiles, tractors, etc. The incorporators are M. C. Kelly, S. L. Mackey and J. D. Frock, all of Wilmington.

Lugreen Motors Corp of Wilmington, with a capital of \$3,000,000, to manufacture automobiles. The incorporators are T. L. Croteau, H. E. Knox and S. E. Dill, all of Wilmington.

Traveler Tire Co. of Pittsburgh, Pa., with a capital of \$100,000, to manufacture tires, etc. The incorporators are S. D. Townsend, Jr., Victor Barsky and George H. Reed, all of Wilmington.

Kenworthy Motors Corp., Chicago, Ill., with a capital of \$6,000,000, to manufacture automobiles. The incorporators are Samuel C. Wood of Chicago, L. B. Phillips and Harry McDaniel, Jr., of Dover, Del.

Allegheny Motor Car Co., with a capital of \$100,000, to manufacture motors. The incorporators are William Maull, Simon Strauss and L. F. Stocker, all of Pittsburgh.

Griffiths & Lann, Inc., with a capital of \$50,000, to deal in automobiles. The incorporators are W. N. Lofland, Frank Jackson and Mark W. Cole, all of Dover, Del.

Central Motor Sales Co., with a capital of \$25,000, to manufacture automobiles. The incorporators are Samuel Greenbaum, Leopold Schorr and Rudolph Schorr, all of Wilmington.

BUILD RIM FACTORY

CLEVELAND, Jan. 20—The Automatic Rim Co. has purchased a plot of ground here on which it will erect a factory for the manufacture of an automatic rim, the invention of W. J. Burns, president of the company.

TO-MAKE ARMORED TIRE

LUDINGTON, MICH., Jan. 16—The Ludington Rubber Co., recently reorganized here, will soon begin manufacturing an armored pneumatic tire.

Current News of
FactoriesNotes of New Plants—
Old Ones EnlargedAnsted Co. Takes Over
A-Z Radiator Works

NEW YORK, Jan. 16—The Ansted Co., Inc., has been organized by Frank B. Ansted, president of the Lexington Motor Co., and will take and continue over the radiator business of the A-Z Co., at 600 West Fifty-seventh Street, New York. Among the patents turned over to the company is the "Hydratube" process of cellular core construction, by which a radiator can be built in any shape.

L. G. Hanmer is president and sales-manager of the new company; Harry W. Gaston is vice-president and treasurer, and George W. Cole, secretary. A technical and art department will be maintained for the convenience of customers.

National Reliner Co.
Increases Its Capital

GRAND RAPIDS, MICH., Jan. 21—The Two-In-One Tire Co. and the National Tire & Reliner Co., of Grand Rapids, are now operating as the First National Tire & Reliner Co., and has increased the capitalization from \$19,500 to \$675,000.

The company started out two years ago as a tire jobber and is now manufacturing National reliners, skived shoes, blow-out patches, and other parts. It has a national distribution system for its products and are making arrangements for exporting to Canada and European countries. Officers of the company are: Reuben Roden, president; Isaac Warsaw, secretary, and A. J. Gorney, treasurer and general manager.

INCREASES CAPITAL

NEWARK, DEL., Jan. 20—The American Machine Co., Newark, Del., manufacturers of the Atlas heavy duty motor truck rear axle, in line for general plans for expansion, have arranged for an increase of capitalization. Factory floor space is to be doubled and considerable additional machinery installed. Production for 1920 will consist mostly of 2 and 3½-ton units, although 5-ton models will be brought out as increased facilities permit.

BRUNSWICK TIRE BUILDS

MUSKEGON, MICH., Jan. 16—Ground will be broken by the Brunswick-Balke-Collender Co., in this city, early in the spring, for large additions to its tire plant. With the new buildings it will have a tire capacity of 5000 daily.

TAKE OVER LACHARNAY

NEW YORK, Jan. 21—Peugeot and Renault interests have combined to form a new company to take over the Lacharnay Carburetor interests in Europe, according to an announcement received in this country a few days ago.

The sale of the European company to the automobile manufacturers, however, does not affect the American company, which continues to supply the trade through the plant in Paterson, N. J.

DAYTON RUBBER GROWS

DAYTON, OHIO, Jan. 16—The Dayton Rubber Co. has been granted permission to increase capital stock from \$1,000,000 to \$10,000,000. Extensive alterations are planned which will give the company greatly increased production. R. L. De Lisser, of Chicago, has been made head of the sales department.

BETZ ENLARGES FACTORY

HAMMOND, IND., Jan. 20—The Betz Motor Truck Co. of Hammond, manufacturers of worm-drive trucks, are building a new 105 x 125 ft. addition to its factory, which gives a total of 28,000 sq. ft. of floor space. At the present time they have contracts for their whole output till April 1. The Betz Co. specializes on a 2½-ton truck.

TO MAKE STANDARD AXLES

WORCESTER, Jan. 19—The Bradley Car Co., now engaged in the making of motor car bodies for the Standard Steel Corp. of Pittsburgh, will start this month on the production of motor car axles for the Standard Eights. The Bradley Co. is a subsidiary company to the Standard Steel Co.

CHARTER NEW BODY CO.

CHARLESTON, W. VA., Jan. 16—A charter has been issued to the Gilmore Manufacturing Co., of Charleston, to manufacture automobile bodies and equipment. The capital stock is \$50,000, and the incorporators are George W. McClintic, B. Stanley Gill, John R. Hayes, W. H. Truslow and Charles Uhrig, all of Charleston.

SELDEN ISSUES MAGAZINE

NEW YORK, Jan. 22—"Truck Transportation" is the name of a new eight-page magazine published monthly by the Selden Truck Corporation. J. E. Pickens, advertising manager, is editor.

ERECT TRAILER PLANT

CINCINNATI, Jan. 16—A large modern factory is being completed in Oakley, a Cincinnati suburb, for the Trailmobile Co., manufacturers of trailers for motor vehicles.

INCREASES CAPITAL STOCK

MILWAUKEE, Jan. 19—The Wisconsin Body & Sales Co., Milwaukee, has increased its capital stock to \$50,000.

Lightfoot Resigns as G. M. C. St. Louis Head

ST. LOUIS, Jan. 16—C. E. Lightfoot, one of the big men of the motor car trade of St. Louis, has resigned as manager of the St. Louis branch of the General Motors (Truck) Co. to become secretary and general salesmanager of the Schlecht Motor Car Co., distributors in the St. Louis trade territory of the Gardner car. Lightfoot has been the G. M. C. manager here for the last four years. He came to St. Louis from Chicago, and was connected with the passenger and truck departments of the Packard Motor Car Co. the first year here.

NEW KELLY DETROIT HEAD

DETROIT, Jan. 16—C. A. Jessup, formerly special sales representative and later branch manager of the Kelly-Springfield Tire Co., at St. Louis, has been named manager of the Detroit office. The new building of the company at Cass Avenue and Antoinette Street is rapidly being completed, and Jessup is perfecting his organization to begin operations in the new quarters.

L. L. McAnaney, of Cleveland, has been appointed Baltimore branch manager for the McGraw Tire & Rubber Co. McAnaney has spent several years in the tire business, the last nine of which have been as Cleveland branch manager for the Goodrich Co.

John D. Olwell has been elected president of the Akron Tire Co.

Arthur W. Freund has been appointed manager of the sales development department of the Swinehart Tire & Rubber Co., Akron, Ohio. He was formerly general manager of the Federal Lamp Division of the General Electric Co., of Chicago.

Arthur H. Story, a former newspaper advertising man, has been appointed general manager and salesmanager of the Keystone Automobile Sales Corp., distributor of the King and Maibohm lines in Philadelphia.

Claude Platt, who for fourteen years has been with the Fisk Rubber Co. in various capacities, the last being special factory representative, has resigned to enter the retail automobile trade in Chicago, his home city.

A. G. Ripberger, formerly of the engineering staff of the Illinois Steel Co., Gary, Ind., has become chief engineer for the steel and tube department of the main plant of the Timken Roller Bearing Co. at Canton, Ohio.

Ernest T. Pearsons has been appointed body engineer for the Stevens-Duryea. He was formerly with the Locomobile Co., Winton and Packard.

James J. Jennings has been appointed assistant to the vice-president of the Hudson Motor Specialties Co. of Philadelphia.

Men of the Industry

Changes in Personnel and Position

MILLER JOINS ALLEN

COLUMBUS, OHIO, Jan. 21—C. R. Miller, formerly works manager of the Willys-Overland Co., Toledo, has been made general manager of the Allen Motor Co. of Columbus. Miller has had wide experience in the fabricating end of the automobile business and before his Toledo connection was general manager of the Miami Cycle & Manufacturing Co. of Middletown, Ohio. The present production at the Columbus plant of the Allen Motor Co. is 30 cars daily. The number will be gradually increased.

SELDEN OFFICIAL DIES

NEW YORK, Jan. 21—E. A. Shelly, assistant salesmanager of the Selden Truck Corp., died at his home in Rochester, Monday, Jan. 19, after a week's illness. Prior to becoming associated with the Shelden organization, Shelly was for a number of years connected with the Vim Motor Truck Co. of Philadelphia.

DIETRICH OFFICIAL DIES

ALLENTOWN, PA., Jan. 20—The Dietrich Motor Car Co. announces with deep regret the death of its treasurer and manager, George W. Hunsicker.

ELECT DOEHLER OFFICERS

NEW YORK, Jan. 16—At the annual meeting of the board of directors of the Doehler Die-Casting Co., held recently at its main office, Brooklyn, the following officers were re-elected:

H. H. Doehler, president; H. B. Griffin, vice-president; O. A. Schroeder, treasurer; O. A. Lewis, assistant secretary.

They also added to their list of officers the following:

J. Kralund, second vice-president, in charge of production, and Charles Pack, secretary and chief chemist.

ELECTS NEW OFFICERS

CLEVELAND, Jan. 16—New officers of the Ohio State Rubber Tire Co. are W. O. Bruess, president; Rudolph Seifield, vice-president; H. S. Ballard, secretary and general counsel, and S. M. Bruess, treasurer. These officers, with J. H. Schaumleffel, constitute the directorate.

The company is capitalized at \$1,000,000 and when its factories are completed will have a capacity of 1500 tires daily.

A. C. Galbraith has been appointed Eastern representative of the United Motors Service Co., and will market the "Foremost" tire, a Detroit product. The Eastern office of the company will be located in New York.

B. G. Koether Becomes Hyatt Vice-President

DETROIT, Jan. 16.—B. G. Koether, for ten years salesmanager in charge of the motor bearings division of the Hyatt Roller Bearing Co., has been promoted to vice-president of the company and will leave Detroit for Harrison, N. J., to assume the duties of his new office. In the eighteen years that Koether has been with Hyatt he has served respectively as an accountant, purchasing agent, assistant salesmanager, and salesmanager of the Detroit branch. In his new work he will direct the sales and advertising departments of the company.

McMAHAN TO JOIN AJAX

SANDUSKY, OHIO, Jan. 21—Announcement is made by Horace De Lissier, president of the Ajax Rubber Co., of the selection of William W. McMahan to take charge of the new Ajax plant at Sandusky. His title will be vice-president in charge of the Sandusky division. McMahan has been in the tire business since 1897 when he entered the employ of the Morgan & Wright Tire Co., Chicago. Recently he has been general factory manager of the Morgan & Wright division of the United States Tire Co.

Matthew R. Riddell has been appointed assistant professor of aeronautic engineering and assistant to the director of the engineering experiment station at the University of Illinois. Riddell was chief draftsman for the Curtiss Aeroplanes and Motors, Ltd., in 1915-16; was connected with the Canadian Aeroplanes, Ltd., of Toronto, 1916-19, and had a prominent part in directing war work.

W. J. Cleary has resigned as assistant purchasing agent of the Studebaker Corp. to become director of purchases for the Willys Corp., at the new Elizabeth, N. J., plant.

E. W. Bernhard, for a number of years connected with the Hess-Bright Mfg. Co., of Philadelphia, as planning manager, has been made assistant to the general factory manager. H. W. Jackson has been promoted to factory manager.

Thomas J. Barry has succeeded F. C. Rudisell as manager of the St. Louis branch of the Firestone Tire & Rubber Co. Barry was transferred here from the Kansas City office of the Firestone, where he was special representative. Rudisell has gone to Omaha to become general manager of the Overland Tire & Rubber Co.

Will F. Hauck, who has been in charge of the State employment bureau for ten years, has been placed in charge of the employment department of the Columbus branch of the Timken Roller Bearing Co. The company will soon complete a large factory in Columbus, which will be placed in operation within two months.

Calendar

SHOWS

- Jan. 17-24—Cleveland, Nine-teenth Annual Automobile Show, Cleveland Automobile Mfrs. and Dealers' Assn., Wigmore Coliseum.
- Jan. 17-24—Hartford, Conn., Shows, State Armory, Annual Exhibition, Arthur Fifoot, Manager.
- Jan. 18-24—Worcester, Mass. Automobile Show, Worcester Automobile Association.
- Jan. 19-25—Oakland, Cal. Annual Motor Show, Alameda County Automobile Trade Assn., Civic Auditorium, Robert W. Martland, Manager.
- Jan. 19-25—Milwaukee, Wis. Auditorium, Annual Motor Exhibition, Milwaukee Automobile Dealers, Inc.
- Jan. 22-24—Lancaster, O. Annual Automobile Show, Fairfield County Auto Trades Assn., Sherman Memorial, W. H. Payne, Manager.
- Jan. 24-31—Chicago, Ill. Coliseum, Cars: Drexel Pavilion, National Automobile Chamber of Commerce, S. A. Miles, Manager.
- Jan. 24-31—Chicago, International Amphitheater, Commercial cars and accessories.
- Jan. 31-Feb. 6—Kansas City, Mo. Annual Exhibition, Overland Bldg., E. A. Peak, Manager.
- Jan. 31-Feb. 7—Minneapolis, Minn. Twin City Automobile Truck, Tractor and Industrial Show, Overland Bldg.
- February—Chicago International Automobile Mfrs.' Congress.
- Feb. 2-7—Rochester, N. Y. Rochester Automobile Trades Assn., Exposition Park, Benjamin L. Peer, Manager.
- Feb. 2-7—Toledo, Ohio. Annual Automobile Show, Terminal Auditorium.
- Feb. 3-7—Wilmington, Del. Automobile Show, Hotel du Pont.
- Feb. 3-7—Baltimore, Md. Automobile Show, Baltimore Automobile Dealers Assn., Fifth Regiment Armory, John C. O'Brien, Manager.
- Feb. 4-7—Peoria, Ill. Passenger Car Show, Peoria Automobile Dealers and Accessory Assn., Coliseum.
- Feb. 9-10—Peoria, Ill. Truck Show, Peoria Automobile Dealers' and Accessory Assn., Coliseum.
- Feb. 9-13—Charlotte, N. C. Automobile Show, Charlotte Automobile Trade Assn., Lee Folger, Chairman, Show Committee.
- Feb. 9-14—Cedar Rapids, Ia. Annual Automobile Show, Linn County Motor Trades Bureau, Auditorium, W. J. Hutchings, Chairman, and H. M. Davis, Secretary.
- Feb. 9-14—Poughkeepsie, N. Y. Annual Automobile Show, Poughkeepsie Auto Club, Armory, George A. Coleman, Manager.
- Feb. 9-14—Salt Lake City. Annual Automobile Show, W. D. Rishel, Manager.
- Feb. 9-14—Nashville, Tenn. Nashville Automobile Trade Association.
- Feb. 10-13—Fargo, N. D. Barry Bldg. Fargo-Moorehead Automotive Trade Assn., H. L. Wilson, Director.
- Feb. 10-15—Quincy, Ill. Annual Automobile Show.
- Feb. 11-14—Mason City, Ia. Sixth Annual Automobile Show, Mason City Automobile Assn., Armory.
- Feb. 13-23—San Bernardino, Cal. Automobile Show, Tenth Annual National Orange Show, Milton Standish, Secretary.
- Feb. 14-21—New Castle, Pa. Annual Automobile Show, Lawrence County Automobile Trades Assn., J. B. Foster, Manager.
- Feb. 14-22—San Antonio, Tex. Automobile Show, San Antonio Automobile Trade Assn., W. A. Williamson, Manager.
- Feb. 16-21—Des Moines, Ia. Annual Automobile Show, Des Moines Automobile Dealers' Assn., Ford Factory, Dean Schooler and C. G. Van Vliet, Manager.
- Feb. 20—Cleveland, Cleveland Section S. A. E., Hotel Statler.
- Feb. 21-28—San Francisco. Fourth Annual Automobile Show, Exposition Auditorium, Motor Car Dealers' Assn., G. A. Wahlgreen, Manager.
- Feb. 21-28—Louisville, Ky. Twelfth Annual Exhibition, Louisville Automobile Dealers' Assn., First Regiment Armory.
- Feb. 23-27—Reading, Pa. Annual Automobile Show, Reading Automobile Trades Assn., Auditorium, N. S. Jorgensen, Manager.
- Feb. 23-28—Elmira, N. Y. Elmira State Armory, Elmira Automobile Club, H. S. Bryan, Manager.
- Feb. 23-28—Springfield, Ohio. Annual Automobile Show, Springfield Automobile Trades Assn., Memorial Hall, W. E. Stevens.
- Feb. 23-28—Portland, Ore. Truck Show, Armory, Dealers' Motor Car Assn., M. O. Wilkins, Manager.

- Feb. 23-28—Portland, Ore. Car Show, Hippoarome Building, Dealers' Motor Car Assn., M. O. Wilkins, Manager.
- Feb. 23-28—Grand Rapids, Mich. Motor Car Show, Furniture Exposition Building, M. D. Elgin, Manager.
- Feb. 23-28—Duluth, Minn. Automobile Show, Duluth Auto Trades Assn., W. F. Daly, Director.
- Feb. 28-March 6—York, Pa. Annual Automobile Show, York County Dealers' Assn., Overland - Harrisburg Garage, R. A. Anderson, Manager.
- Mar. 1-6—Springfield, Mass. Annual Automobile Show, Auditorium, Springfield Automotive Dealers' Assn., Robert H. Clark, Manager.
- Mar. 1-6—St. Joseph, Mo. Annual Automobile Show, St. Joseph Automobile Show Assn., Auditorium, John Albus, Manager.
- Mar. 1-6—Grand Rapids, Mich. Truck Show, Furniture Exposition Bldg., M. D. Elgin, Manager.
- Mar. 1-7—Springfield, Mass. Annual Automobile Show, Springfield Automobile Dealers' Assn., Harry Stacy, Secretary.
- Mar. 1-8—Seattle, State Armory, Motor Car Dealers' Assn., William J. Coyle, Manager.
- March 3-6—Clinton, Ia. Annual Automobile Show, Clinton County Automobile Dealers' Assn., Coliseum, Harry G. Finch, Manager.
- March 6-13—New York, N. Y. Second Annual Aeronautical Exposition, Manufacturers' Aircraft Assn., Inc., 71st Regiment Armory, Walter Hempel, Manager.
- Mar. 7-13—Muskegon, Mich. Automobile Show, Muskegon Auto Business Men's Assn., J. C. Fowler, Manager.
- Mar. 10-13—Lebanon, Pa. Annual Motor Show, Automotive Trade Association of Lebanon, James Furniture Store-Bldg., J. Paul Enck, Manager.
- Mar. 12-20—Boston, Mass. Annual Automobile Show, Mechanics' Building.
- Mar. 15-20—Great Falls, Mont. Automobile Show, Montana Automobile Distributors' Association.
- Mar. 20-27—Trenton, N. J. Annual Automobile Show, Armory, Trenton Automobile Dealers' Assn., John L. Brock, Manager.
- March 20-27—Pittsburgh, Motor Square Garden, Automotive Association, Inc., John J. Bell, Manager.
- January—Glasgow, Scotland. Scottish Motor Exhibition.
- February—Manchester, England. North of England Motor Exhibition.
- Feb. 22-28—Ottawa, Ontario. Motor Show.
- Feb. 22-March 6—Birmingham, England. British Industries Fair.
- March—London, England. Motor Boat Marine and Stationary Engine Exhibition.
- March—Adelaide, Australia. All Australian Exhibition of motor vehicles, airplanes, engines and automotive equipment.
- March 1-15—Lyons, France. Automotive Products, Lyons Industrial Fair.
- April or May—London, England. Commercial Vehicle Exhibition, Olympia.
- April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.
- July—London, England. International Aircraft Exhibition, Olympia. The Society of British Aircraft Constructors.

TRACTOR SHOWS

- Feb. 2-14—Wichita, Kan. Tractor and Farm Machinery Forum, Wichita Thresher-Tractor Club.
- Feb. 16-21—Kansas City, Mo. Fifth Annual Kansas City Tractor Club, Guy H. Hall, Manufacturer.

CONTESTS

- August, 1920—Paris, France. Grand Prix Race, Sporting Commission Automobile Club of France.
- June, 1920—Omaha, Neb. Reliability Truck Tour.

CONVENTIONS

- Feb. 9-13—Louisville, Ky. Seventeenth Annual Convention, American Road Builders' Assn., Tenth American Good Roads Congress, and Eleventh National Good Roads Show.
- May 13-20, 1920—San Francisco. Seventh National Foreign Trade Convention.

S. A. E. MEETINGS

- Jan. 28—Chicago, Truck and Tractor Meeting, Hotel La Salle.
- Feb. 12—Kansas City, Mo. Tractor Dinner, Hotel Baltimore.

Will Show 70 Makers
at Baltimore Event

BALTIMORE, MD., Jan. 16—What promises to be the greatest motor car show ever held in this city will take place Feb. 3 to 7 at the Fifth Regiment Armory. Sixty motor car dealers will have exhibits and more than 70 makes of cars, many of them new to Baltimoreans as far as being shown at an exhibition is concerned will be on display.

The show will be run by the Balti-

more Automobile Dealers Association, Inc., of which E. R. Myers is president and John C. O'Brien secretary. O'Brien will be general manager of the show and H. M. Luzius, secretary of the Auto Club of Maryland, advisor. This will be the first time the dealers have run a show themselves.

HALFUR INCREASES STOCK

CLEVELAND, Jan. 19—Papers have been filed with the secretary of state increasing the authorized capital of the S. W. Halfur Motor Truck Co.

BODY OUTPUT SOLD AHEAD

FOND DU LAC, WIS., Jan. 19—The Longdin-Brugger Co., Fond du Lac, Wis., manufacturer of winter bodies for open passenger cars, as well as truck bodies and cabs, has taken an order from the Winther Motor Truck Co. and affiliated companies at Kenosha, Wis., for truck cabs which represents \$250,000 and covers a delivery period of two years, beginning April 1. The Longdin-Brugger Co., as already noted, is breaking ground for a new factory, 100 x 200 ft., and recently increased its capital stock.